KEOR T 10 – 60 KVA

INSTALLATION MANUAL

Important Notices!

Thank you for choosing LEGRAND UPS System to supply your Critical Application.

This manual contains important information about commissioning, usage and technical properties of the UPS. It also contains safety information for operator and instructions to secure your critical load. Applying the recommendation detailed in this manual is necessary to use UPS safely and correctly.

Read the manual completely before working on this equipment!

Keep this manual in UPS's front cover's pocket for easy consultation!

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Units that are labelled with a CE mark comply with the Standard: EN 62040-1 and EN 62040-2.

CE

Description of the Symbols Used in the Manual

	This symbol points out the instructions which are especially important.
	This symbol points out the risk of electric shock if the following instruction is not followed.
	This symbol points out the instructions, which may result with injury of the operator or damage of the equipment if not followed.
	All packing material must be recycled in compliance with the laws in force in the country where the system is installed.

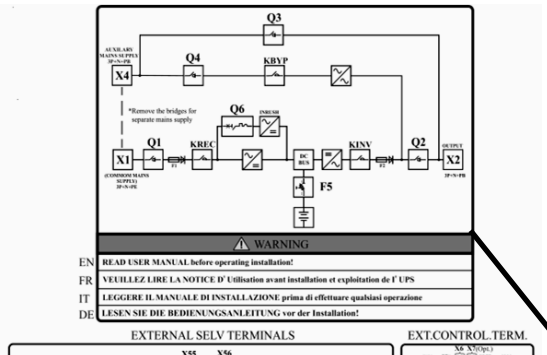
Description of the Abbreviations Used in the Guide

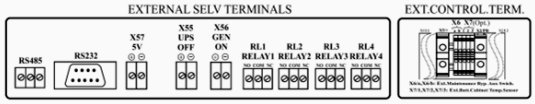
UPS: Uninterruptible Power Supply
ESD: Emergency Switching Device
RS232: Serial Communication Protocol
RS485: Serial Communication Protocol
MODBUS: Modicon Communication Protocol
SNMP: Simple Network Management Protocol
V: Voltage
A: Ampere
P: Power

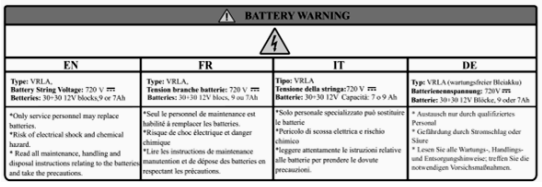
For Mains Supply, Auxiliary Mains Supply, Output, Battery Circuit Breaker and Maintenance Bypass Circuit Breaker;
“ON”: Closing the Circuit
“OFF”: Opening the Circuit

⚠ WARNING

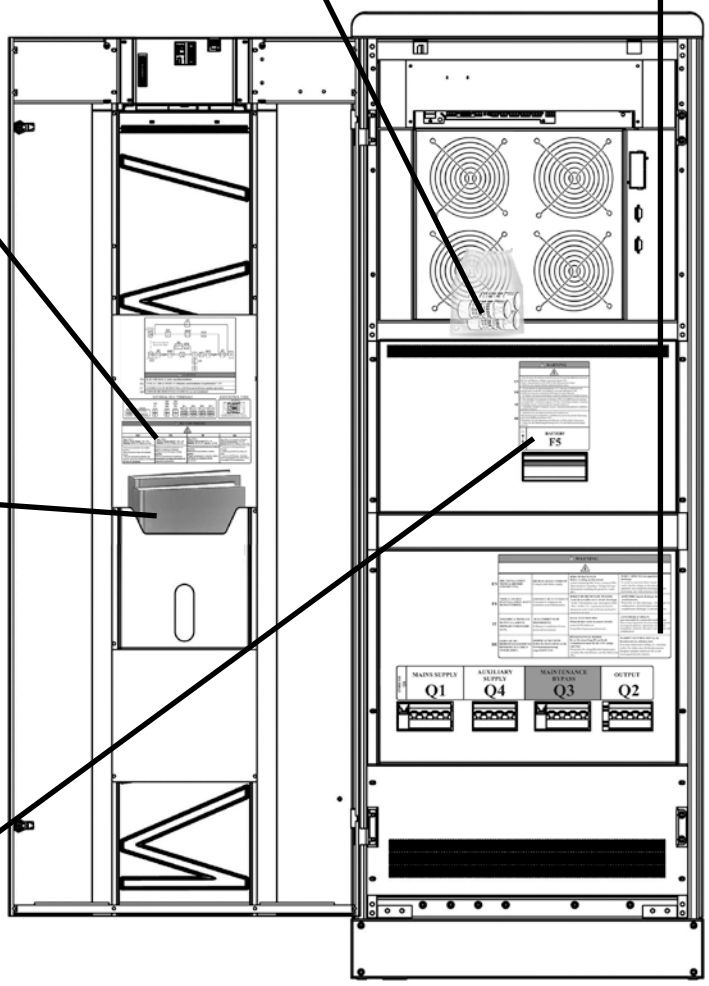
EN	SEE INSTALLATION MANUAL BEFORE CONNECTING.	HIGH LEAKAGE CURRENT Connect earth before supply.	RISK OF BACKFEED **Before working on this circuit** isolate Uninterruptible Power System (UPS). Then check for Hazardous Voltage between all terminals including the protective earth (PE).	**WAIT 5 MINUTES for capacitors to discharge.** To avoid an electrical shock hazard verify that the voltage on the electrolytic capacitors has completely discharged before performing any work on power module.
FR	VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER.	COURANT DE FUITE ELEVE Connecter le conducteur de protection avant l'alimentation.	RISQUE DE RETOUR DE TENSION **Avant de travailler sur le circuit électrique** - Isoler l'alimentation sans interruption (ASI) - Puis vérifier s'il y a présence de tension dangereuse entre toutes les bornes incluant la connexion de terre.	**ATTENDRE 5mn la décharge des condensateurs.** Pour éviter un choc électrique , vérifiez que les condensateurs electrolytiques soient complètement décharges avant intervention.
IT	LEGGERE IL MANUALE DI INSTALLAZIONE PRIMA DI COLLEGARE l'UPS.	ALTA CORRENTE DI DISPERSIONE Collegare il conduttore di terra prima dell'accensione	BACK FEED RISCHIO **Prima di intervenire su questo circuito** isolare l'UPS dalla rete. Controllare la presenza di tensioni	**ATTENDERE 5 MINUTI per consentire la scarica dei condensatori** Per evitare il pericolo di scosse elettriche prima di eseguire qualsiasi operazione sul modulo di potenza verificare che non vi sia tensione sui condensatori.
DE	LESEN SIE DIE BEDIENUNGSANLEITUNG BEVOR SIE DAS GERÄT ANSCHLIEßEN.	HOHER LECKSTROM. **Erden Sie das Gerät bevor die Versorgungsspannung zugeschaltet wird.**	RÜCKSPANNUNG RISIKO **Bevor Sie einen Eingriff am Gerät vornehmen trennen Sie die USV-Anlage vom Netz.** Überprüfen Sie auf gefährliche Spannungen zwischen den Anschlüssen und der Schutzerde (PE).	**WARTEN SIE 5 MINUTEN bis die Kondensatoren entladen sind.** Um einen elektrischen Schlag zu vermeiden stellen Sie sicher, dass die Kondensatoren komplett entladen sind bevor Sie an der Leistungselektronik arbeiten.







Battery Fast Fuses



Installation & Operating Manuals

⚠ WARNING

EN	‣ Do not close the battery circuit breaker (F5) until the difference between DC bus and Battery voltages decreases below 10V. Check measurement on the LCD in the Measurement menu. ‣ Refer to user manual before replacing battery fuses.
FR	‣ Ne pas fermer la protection batterie (F5) tant que le différence de tension entre le bus DC et la Batterie n'est pas inférieure à 10V. Vérifiez les mesures sur l'écran LCD dans le menu Mesures. ‣ Se référer à la notice d'utilisation avant de remplacer les fusibles batterie.
IT	‣ Non chiudere il sezionatore di batteria, (F5) se la differenza di tensione tra la barra DC e le batterie supera i 10 Vdc. Controllare sempre le tensioni sul display (menu misure) prima di eseguire manovre. ‣ Consultare sempre il manuale di uso e manutenzione prima di sostituire i fusibili di batteria.
DE	‣ Schließen Sie den Batterieschalter (F5) nicht bevor Gleichspannungszwischenkreis und Batteriesystem die gleiche Spannung aufweisen (Differenz kleiner 10V). Überprüfen Sie die Spannung mit Hilfe des LCD im Menü Messwerte. ‣ Lesen Sie die Bedienungsanleitung bevor Sie die Batteriesicherungen ersetzen.

I ON 0 OFF

BATTERY

F5

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1. FOREWORD

1.1. Overview

Thank you for choosing LEGRAND UPS Keor T product.
KEOR T has been designed with advanced technologies and the latest components generation; realized to satisfy both users and installers in their operational needs of high availability and performance.
This UPS aims to be efficient, functional, safe and very easy to install and use. LEGRAND has studied the best way to reconcile high-tech performance and ease of use, making “user friendly” technologically advanced products.

KEOR T supplies maximum protection and power quality for any type of IT load, tertiary application, lighting or building. Furthermore, standards deployed by Legrand for R&D, supplier selection and manufacturing complies with the highest quality standards. This product is manufactured in an ISO 9001 & ISO14001 certified factory in full compliance with the eco-design laws. The UPS Keor T system is made in compliance with the existing European Community directives and with the technical standards in force to comply with CE marking as certified by the Declaration of Conformity issued by the Manufacturer.

Technology & Architecture

A special feature of Keor T is Online Double Conversion Operation (VFI-SS-111 as defined by the reference standard EN 62040-3) based on the capacity to supply a voltage that is perfectly stabilized in frequency and amplitude, even in event of extreme alterations of mains power supply.
The 3-Level Switching Technology used in this product is the latest solution to provide high energy efficiency even with low load conditions.

The energy efficiency performance of Keor T surpasses the minimum requirements defined by the Code of Conduct on Energy efficiency and Quality of European of AC UPS defined by EC.

KEOR T represents the best solution combining high performance, low management costs and ease of operation and maintenance:

- Dual Input
- User friendly touch screen design
- UPS via LED bar (with traffic light coding) gives an immediate diagnosis of the system under any conditions.
- Internal Battery option as well as wide range external battery cabinets.
- Isolation transformer can be mounted inside UPS cabinet upon request.
- Integrated Maintenance Bypass
- Parallelable to increase the power
- Availability of different communication types

1.2. Manual

- The purpose of this manual is to provide indications for using the equipment safely and to carry out first level of troubleshooting.
- This manual is addressed to persons already educated on precautions to adopt in face of electrical hazard
- This manual is addressed to “User“, generic term to identify all persons that will have the need and / or obligation to provide instructions or operate directly this UPS equipment
- Adjustments, preventive and curative maintenance jobs are not dealt with in this manual as they are reserved exclusively to skilled and authorized Legrand UPS Technical Service Engineers.
- The intended use and configurations envisaged for the equipment are the only ones allowed by the Manufacturer; do not attempt to use the equipment in disagreement with the indications given. Any other use or configuration must be agreed and written by the Manufacturer, in such a case, will be an enclosure to the manual.
- For its use the user must also comply with the specific laws in force that exist in the country where the equipment is installed. Reference is also made in this manual to laws, directives, etc., that the user must know and consult in order to fulfil the purposes established by the manual.
- If information is exchanged with the Manufacturer or assistance personnel authorized by the former, please refer to the equipment’s rating plate data and serial number.

- The manual must be kept for the equipment's useful life cycle and, if necessary (e.g. damage which prevents it being consulted even partially) the user must ask the Manufacture for a new copy, quoting the publishing code on the cover.
- The manual reflects the state of the art at the moment the equipment was put on the market, of which it is an integral part. The publication complies with the directives in force at such a date. The manual cannot be considered inadequate if updates of standards or changes are made to the equipment.
- Any integration to the manual which the Manufacturer deems fitting to send to the users must be kept with the manual, becoming an integral part of it.
- The Manufacturer is available to its clientele to provide additional information and will take into consideration any suggestions made to improve this manual to bring it even closer to the requirements for which it was drawn up.
- If the equipment is sold, which always includes handing over this operating manual, the primary user must notify the Manufacturer, giving him the address of the new user so the latter can be reached if there are any communications and/or updates deemed indispensable.

Read the manual completely before working on this equipment!

Keep this manual in UPS's front cover's pocket for easy consultation!

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CE

2. WARRANTY

2.1. Terms of Warranty

- Warranty period begins from the date of commissioning of the UPS by authorized LEGRAND UPS Technical Service staff or authorized LEGRAND distributor Technical Service Staff.
- The UPS including all the internal parts is under the warranty of LEGRAND.
- If the UPS malfunctions because of component, manufacturing or installation (if it's done by authorized LEGRAND UPS Technical Service Personnel) problems during the warranty period, the UPS will be repaired (spares and labour) by the Manufacturer under warranty.

2.2. Out of Warranty Terms and Conditions

This Warranty does not apply if:

- UPS not commissioned or maintained by an authorized LEGRAND UPS Technical Service staff or an authorized LEGRAND distributor Technical Service staff
- UPS not used according the terms of operating and installation manual
- Product serial number label has been removed or lost

This Warranty does not cover any defects or damages caused by:

- Neglect, accident, misuse, misapplication
- Failure due to fortuitous circumstances or force majeure (lightning, floods…etc.),
- Unloading and transportation damage and failures after delivery,
- Damage or injuries caused by negligence, lack of inspection or maintenance, or improper use of the products,
- Faulty electrical wiring,
- Defects arising either from designs or parts imposed or supplied by the purchaser,
- Defects and damage by fire and lightning,
- Failures due to modification in the products without LEGRAND approval,
- Improper installation, testing, operation, maintenance, repair, alteration, adjustment, or modification of any kind by unauthorized personnel,

The Manufacturer will repair the device in such cases for a fee and is not responsible for the shipment of the equipment.

The Battery warranty does not apply if the temperature in the room exceeds 25 °C.
Extended battery warranty does not apply if:

- UPS has not been commissioned
- A yearly preventive maintenance visit has not been performed

By an authorized LEGRAND UPS Technical Service staff or authorized LEGRAND distributor Technical Service staff.

The UPS may contain batteries that should be recharged 24Hours min after 6 month storage duration to avoid deep battery discharge. Warranty cannot apply on batteries that have suffered of deep discharge.

3. SAFETY

Information related to safety of the UPS, battery, load and the user is summarized below. But the equipment should not be installed before reading the manual completely.

3.1. Description of the Symbols Used on the Labels Applied to the UPS

PE: PROTECTIVE EARTH

PB: PROTECTIVE BOUNDING

DANGER! HIGH VOLTAGE (BLACK/YELLOW)

This symbol points out the instructions, which may result with injury of the operator or damage of the equipment if not obeyed.

3.2. Individual Protective Gear

There is a high risk of electrical shock with the equipment as well as a considerable short circuit current. When installing and servicing the equipment it is absolutely forbidden to work without the protective gear mentioned in this paragraph. The personnel who are going to work with the equipment for installation or maintenance jobs must not wear clothes with baggy sleeves or laces, belts, bracelets or other metal items that could be a hazard source.

The following indications summarize the protective gear to wear.

Accident and spark proof footwear with rubber sole and reinforced toe
Use: always

Waterproof rubber gloves
Use: always

Protective gear
Use: always

Protective glasses
Use: always

3.3. Important Notice for UPS

- The equipment may only be installed and commissioned by authorized LEGRAND UPS Technical Service Personnel.
- This manual contains important instructions that you should follow during installation and maintenance of the UPS and batteries. Please read all instructions before installing the equipment and save this manual for future reference.
- Not obeying the instructions written on this manual which may result with possible injury of the operator or damage of the equipment.
- The equipment shall be packed properly during transportation and proper equipment should be used for transportation. Never transport in horizontal position.
- The UPS must always stands in a vertical position. Make sure that the floor can support the weight of the system.
- Connect the PE ground connector before connecting any other cable.
- UPS is designed for indoor use. To reduce the risk of fire or electric shock, install this UPS in a temperature and humidity controlled indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum without condensation).
- UPS requires 3Ph-N+PE input connection.
- Do not connect the output neutral to the protective ground or protective bounding (except the TNC Option). Keor T does not modify the neutral arrangements of the system; the use of an isolation transformer is required should it be necessary to modify the neutral arrangements downstream Keor T.
- KEOR T must be protected from voltage surge with devices that are suited to the installation; the mains voltage surge must be limited to 2kV. These protective devices must be sized to take into account all the installation parameters (geographical position whether or not there is a lightning rod, whether or not there are other suppressors in the electrical installation, etc)
- Even when connections removed, residual voltages of capacitors and/or high temperature may exist on connection terminals and inside the UPS. Before working on terminals, check between all the terminals included PE that no hazardous voltages exist.
- The connections shall be made with cables of appropriate cross-section in order to prevent the risk of fire. All cables shall be of insulated type and shall not be laid out on the walking path of the persons.
- Contact your local recycling or hazardous waste center for information on proper disposal of the used battery or UPS.
- Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.
- In case of an extraordinary situation (damaged body, cabinet or connections, penetration of foreign materials into the body or cabinet etc.) de-energize the UPS immediately and consult to the LEGRAND Technical Assistance Center.
- When used for particular applications such as life support systems or any other application where product failure is likely to cause substantial harms to person, we would advise you to contact LEGRAND UPS to confirm the ability of these products to meet the requested level of safety, performance, reliability and compliance with applicable laws, regulations and specifications.

3.4. Important Notice for Battery

- **The batteries may only be installed and commissioned by authorized LEGRAND UPS Technical Service Personnel.**
- Make sure that the battery qty is proper for the unit and they are same type and capacity. Otherwise danger of explosion and fire is within the bounds of possibility.
- Do not dispose of batteries in a fire. The batteries may explode.
- Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
- In case of electrolyte in contact with skin, immediately wash the contaminated skin with water.
- Replaced batteries must be disposed of at authorized battery waste disposal centers.
- **A battery can present risk of electric shock and high short circuit currents.**
  The following precautions should be observed when working on batteries;
    - ❖ Remove rings, watches, necklaces, bracelets and all metal objects.
    - ❖ Only use tools with insulated handles.
    - ❖ Wear rubbers gloves and a rubber apron when handling batteries.
    - ❖ Do not lay tools or metal parts on top of batteries.
    - ❖ Eye protection should be worn to prevent injury from accidental electrical arcs.
- **Before a maintenance or repair work on the UPS;**
    - ❖ Switch the input, output and battery circuit breakers (**Q1, Q2** and **F5**) to **"OFF"** position.
    - ❖ If UPS has internal batteries; Remove **+** battery (red) and **N** battery neutral (blue) cables.
    - ❖ If UPS has external batteries; also switch the circuit breakers of the battery cabinet to **"OFF"** position.
    - ❖ Determine if the battery is inadvertently grounded. If inadvertently grounded; remove source of ground. Contact with any part of a grounded battery can result in electrical shock.
- Battery fuses shall only be replaced with the same rating and type which came along with the UPS.

3.5. Emergency interventions

The following information is of a general nature. For specific interventions please consult the laws existing in the country where the equipment is installed.

First aid interventions

If any first aid intervention is required, comply with company rules and traditional procedures.

Fire-prevention measures

Never use water to extinguish fire but only the extinguishers designed specifically for electronic equipment or battery fires.

4. REQUIREMENT

4.1. Transportation

The UPS must be placed and stand in a vertical position throughout the transportation.

Use suitable equipment to remove the UPS from the pallet.

The equipment shall be packed properly during transportation. Therefore it is recommended to keep the original package for future need.

All packing material must be recycled in compliance with the laws in force in the country where the system is installed.

4.2. Placement

This product meets the safety requirements for devices to be operated in restricted access locations according to EN 60950-1 safety standard, which states that the owner should guarantee the following:

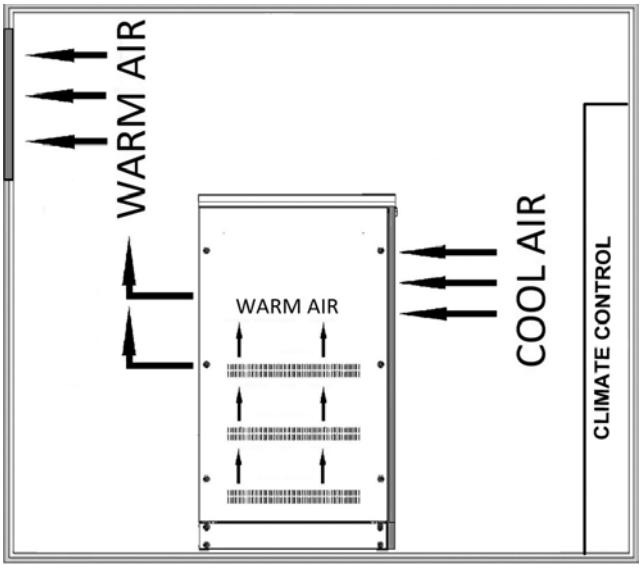
- Access to the equipment can only be gained by service persons or by users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken and,
- Access is through the use of a tool or lock and key, or other means of security and is controlled by the authority responsible for the location.
- UPS is not designed for outdoor application.
- The equipment and the batteries should not be exposed to direct sunlight or placed near to a heat source.
- Recommended operating temperature and humidity values are listed on the Appendix-1 Technical Specifications.
- Avoid dusty environments or areas where dust of conductive or corrosive materials is present.
- The connection and the circuit breakers are at the front of UPS. Leave access at the front of the UPS for maintenance. (Refer to Figure.4.2-3)
- Air outlets of the UPS are at the front, back and on both sides. Leave access at the front side, back side and from both lateral sides for ventilation and battery replacement. (Refer to Figure.4.2-1, 4.2-2 and 4.2.-3)
- Recommended environmental humidity condition is between 20-95% (non-condensing).

Environment Requirement							
Model (kVA)		**10**	**15**	**20**	**30**	**40**	**60**
Max. dissipation at full load	**(W)**	470	705	940	1410	1880	2820
	(BTU)	1604	2406	3207	4811	6415	9622
Storage temperatures		-25/+55 °C (-13/131 °F) (15-25 °C for maximum battery life)					
Working temperature		0/40 °C (32/104 °F) (15-25 °C for maximum battery life)					
Maximum relative humidity		95% max. without condensation					
Maximum altitude without derating		1.000 m (3.300 ft)					
Degree of protection		IP 20 (other IP as option)					
Colour cabinet		RAL 7016@enclosure RAL 9005@front door metal					

Table.1

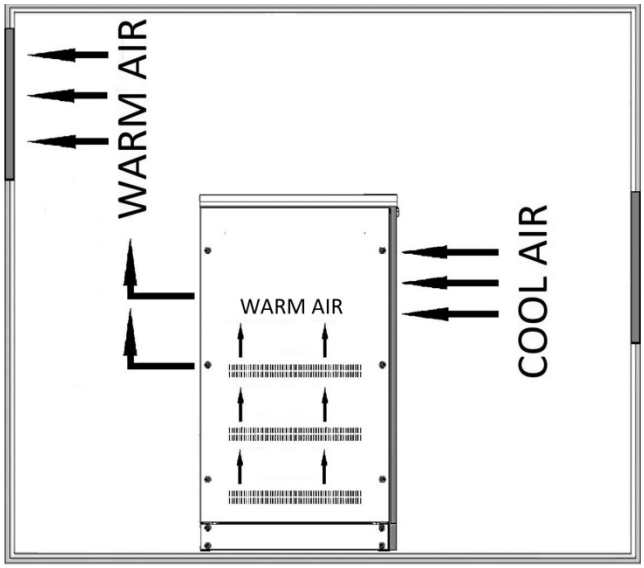
Optimal battery life time is reached when battery ambient temperature is kept between 15°C and 25°C. Operating battery at 30°C ambient temperature compared to 20°C will divide by factor 2 battery life time. Room thermal management as specified above is then necessary to avoid battery life time reduction. The Battery warranty does not apply if the temperature in the room exceeds 25°C.

Figure.4.2-1



Climatization

Figure.4.2-2

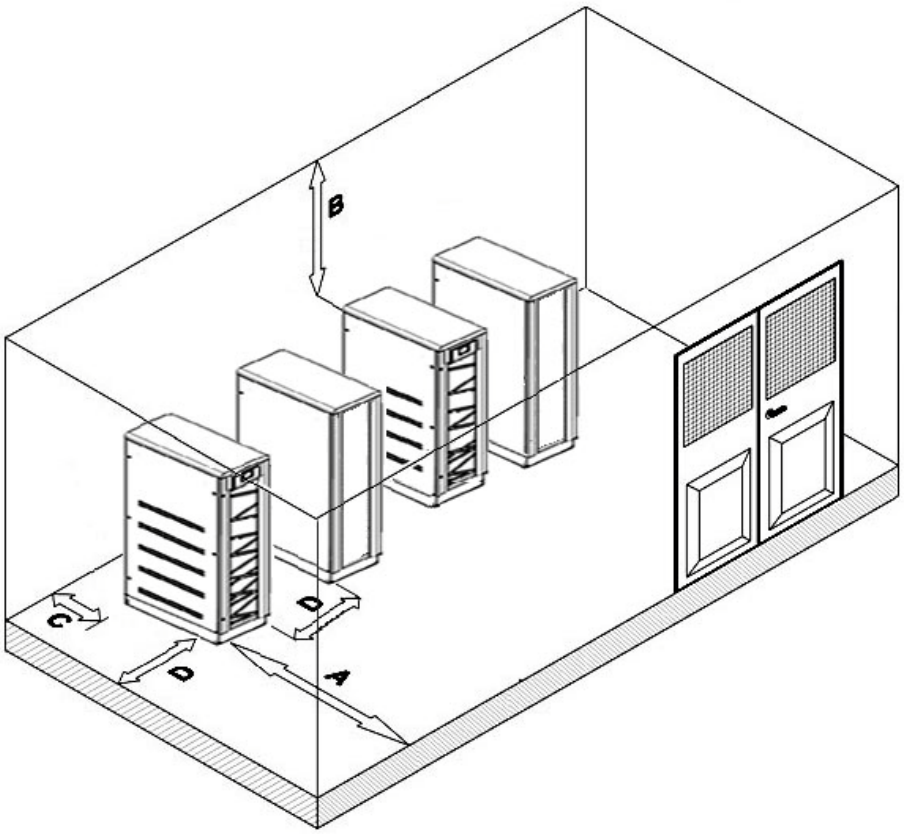


Ventilation

Direction of ventilation is front/sides to back.

The room should be equipped with ventilation system or air conditioning to collect warm air from the top of the room and provide cool air at the bottom.

Figure.4.2-3



ROOM LAYOUT RECOMMENDATION TABLE

A (mm)	B (mm)	C (mm)	D (mm)
700	500	250	10-30kVA : 500 (for maintenance and internal battery installation) 40-60kVA : 700 (for maintenance and internal battery installation)

In order to profit from optimal ventilation, the side panels must remain in place for UPS with internal battery.

The UPS should be mounted on a concrete surface and non-combustible surface.

4.3. Storage

Please store the UPS in an environment where the temperature is between -25°C + 55°C, no receipt of direct sunlight, far from the heating, in a dry place.
Environmental humidity must be between 20-95% (non-condensing).
Recommended storage temperature, humidity and altitude values are listed on the Appendix-1 Technical Specifications section.
If the batteries will be stored for longer than 6 months, they shall be charged periodically. Charge period depends on the storage temperature, as shown below:

- Every 9 months if the temperature is below 20°C,
- Every 6 months if the temperature is between 20°C and 30°C,
- Every 3 months if the temperature is between 30°C and 40°C,
- Every 2 months if the temperature is over 40°C

For long storage duration; please follow up the instructions of installation described in Section 5, start-up UPS described in Section 6 and charge the batteries at least 10 hours.

4.4. Electrical Requisites

The installation must comply with national installation regulations.
The electrical distribution panels for common mains supply voltage and auxiliary mains supply voltage inputs must have a protection and disconnection system. Disconnection devices used in these panels shall disconnect all line conductors simultaneously. The following table shows the recommended size of common mains supply voltage and auxiliary mains supply voltage input protection devices (thermal, magnetic and differential) and the cable cross-sections for the linear loads.

When dual inputs is used:

- Separate Neutral conductor is necessary to be supplied for each input: Common Mains Input and Auxiliary Mains Input
- The two inputs should be supplied by the same MV/LV transformer source. If this is not the case, an insulation transformer should be added in the auxiliary mains line upstream the UPS.
- Separate protection is necessary for each input line.

Installation Parameters							
Model (kVA)		**10**	**15**	**20**	**30**	**40**	**60**
Phase in/out		3Ph+N/3Ph+N					
Rated output apparent power (kVA)		10	15	20	30	40	60
Rated output active power (kW)		9	13,5	18	27	36	54
Rated input current (A) at 400V nominal input voltage		14	21	28	42	57	84
Maximum input current (A) at 340V input voltage + full load + battery charging		18	27	36	54	72	105
Rated bypass current (A) at 400V nominal input voltage		15	22	29	44	58	87
Maximum bypass current (A) at 400V, 125% overload 10 min		19	28	36	55	73	109
Inverter output current @ 400V (A)		15	22	29	44	58	87
Maximum Inverter output current (A) at 400V, 125% overload 10 min		19	28	36	55	73	109
Overload tolerated by the inverter (with mains power present) (kW)	**10 min**	11,3	16,9	22,5	33,8	45	67,5
	1 min	13,5	20,3	27	40,5	54	81
Recommended Protection Devices – Rectifier –							
D curve circuit breaker (A) (3-pole)		20	25	40	50	63	100
GG fuse (A)		20	25	40	50	63	100
Recommended Protection Devices – General Bypass –							
D curve circuit breaker (A) (3-pole)		20	25	40	50	63	100
Protection Devices – Battery Fast Fuse –							
Ferrule style high speed fuses and with indicating striker		25	32	50	63	80	100
Recommended Protection Devices – Output –							
C curve circuit breaker (A) * (3-pole)		≤4	≤4	≤6	≤10	≤13	≤20
Max. Cable Cross-Section for Terminals							
Rectifier (mm²)		35					
General Bypass (mm²)		35					
Output (mm²)		35					
Neutral (mm²)		35					
Protective Earth/Bounding		Recommended cross section for ground wire at least half of the section of cable phases AND shall comply with the standards of the country (for example NFC 15100 in France).					
Leakage Current Protection**		Minimum 300 mA delayed When used , the residual current earth leakage protection system must be common for the two AC inputs (common & auxiliary mains) and installed upstream.					

Table.2

*Recommended discrimination of UPS downstream distribution with inverter short-circuits current (battery mode).

**Load leakage currents are added to those generated by the UPS. If loads with high leakage currents are present, adjust this value accordingly. It is recommended to adjust the protective device after measuring the total leakage current with the UPS installed and operational with the intended load.

During transitory phases (power failure, return and voltage fluctuations) short leakage current peaks may occur. Make sure that the protection is not activated in such cases.

If the loads have a nonlinear characteristic, the current on the common mains supply voltage and auxiliary mains supply voltage input and output neutral conductors may have a value that is 1.5-2 times the phase value during operation. In this case, size the neutral cables and the input/output protection adequately.

5. INSTALLATION

When the UPS is delivered, examine the packaging and product carefully to see if any damage occured during transport. If either possible or ascertained damage is found report it immediately to:

- the carrier;
- LEGRAND Technical Assistance Center.

Make sure that the unit received corresponds to the material specified on the delivery document. The UPS Keor T packaging protects the equipment against mechanical and environmental damages. For greater protection it is also wrapped in a transparent film.

Check if the following are provided with the equipment

- UPS
- Operating Manual
- Installation Manual
- Key for door
- Battery fuses (three pieces)
- Plinths

Before the installation, please check if your UPS is customized following your special requirements (if any).

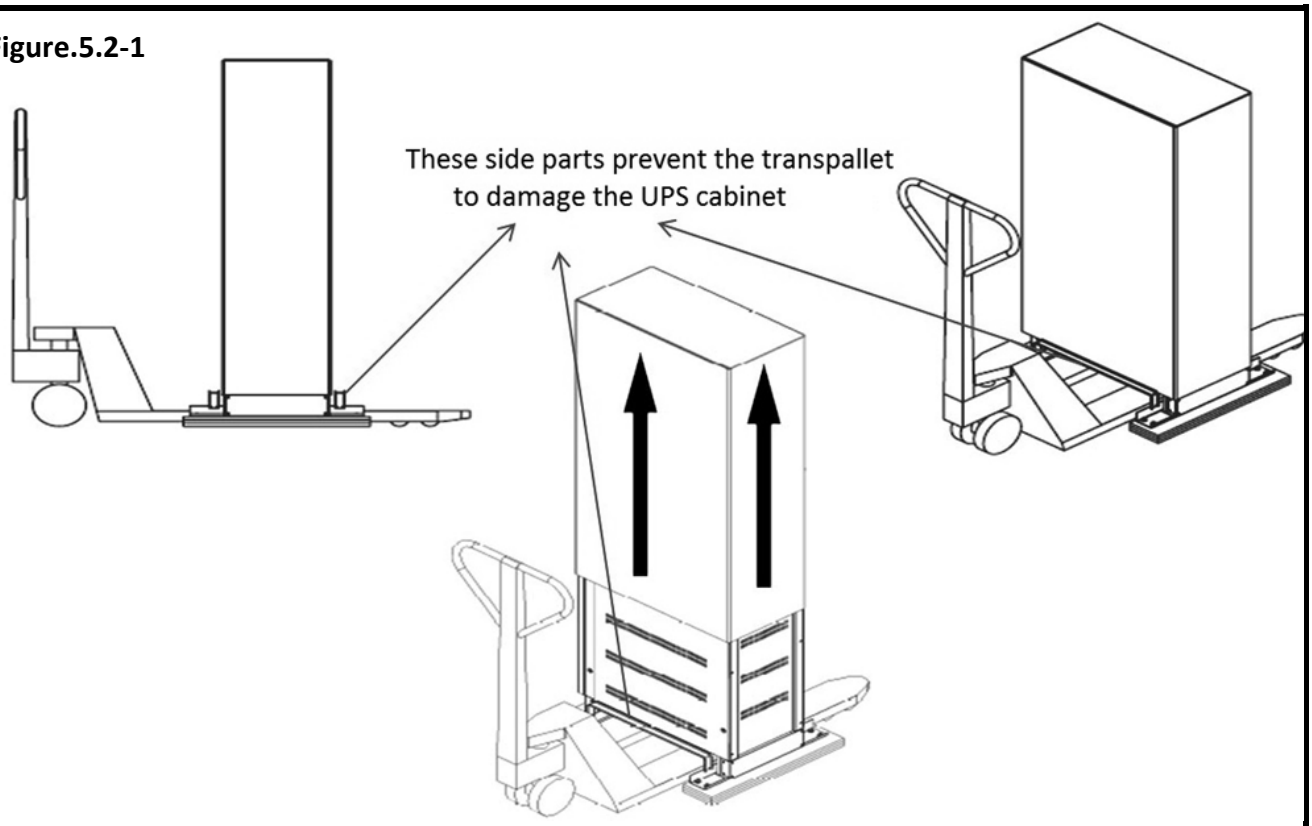
5.1. Models and Dimensions

Legrand Reference	UPS Type	Dimension (HxWxD)	Weight (Kgs)	Internal Batteris Type
310200	10kVA Model 0	1345 x 400 x 800	121	No battery
310201	10kVA Model 1	1345 x 400 x 800	264	60 blocks 7 AH
310202	10kVA Model 2	1345 x 400 x 800	278	60 blocks 9 AH
310203	10kVA Model 3	1650 x 400 x 800	426	120 blocks 7 AH
310204	15kVA Model 0	1345 x 400 x 800	132	No battery
310205	15kVA Model 1	1345 x 400 x 800	272	60 blocks 7AH
310206	15kVA Model 2	1345 x 400 x 800	290	60 blocks 9 AH
310207	15kVA Model 3	1650 x 400 x 800	428	120 blocks 7 AH
310208	20kVA Model 0	1345 x 400 x 800	144	No battery
310209	20kVA Model 1	1345 x 400 x 800	286	60 blocks 7AH
310210	20kVA Model 2	1345 x 400 x 800	304	60 blocks 9 AH
310211	20kVA Model 3	1650 x 400 x 800	486	120 blocks 7 AH
310212	30kVA Model 0	1345 x 400 x 800	148	No battery
310213	30kVA Model 1	1345 x 400 x 800	309	60 blocks 9 AH
310214	30kVA Model 2	1650 x 400 x 800	455	120 blocks 7 AH
310215	30kVA Model 3	1650 x 400 x 800	491	120 blocks 9 AH
310216	40kVA Model 0	1650 x 600 x 900	241	No battery
310217	40kVA Model 1	1650 x 600 x 900	552	120 blocks 7 AH
310218	40kVA Model 2	1650 x 600 x 900	588	120 blocks 9 AH
310219	40kVA Model 3	1650 x 600 x 900	764	180 blocks 9 AH
310220	60kVA Model 0	1650 x 600 x 900	276	No battery
310221	60kVA Model 1	1650 x 600 x 900	625	120 blocks 9 AH
310222	60kVA Model 2	1650 x 600 x 900	799	180 blocks 9 AH

Table.3

5.2. Unpacking Procedure

Figure.5.2-1



Remove the wrap and the package.

Figure.5.2-2

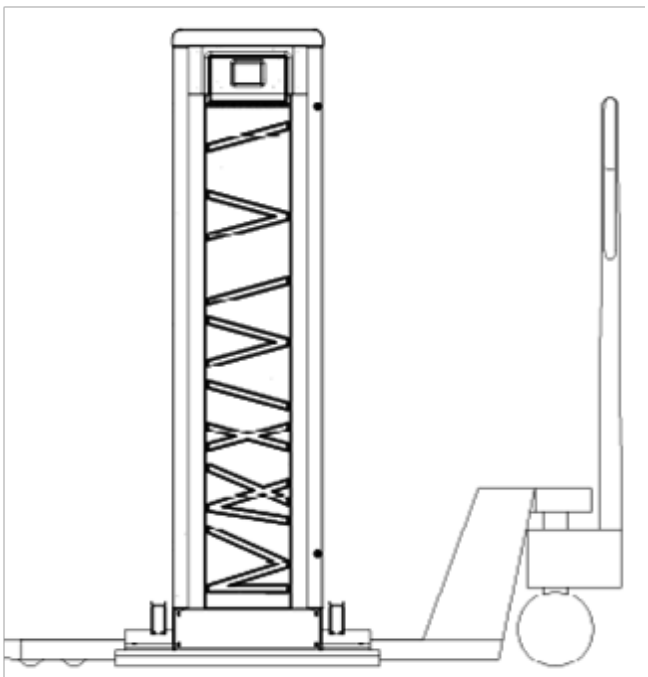
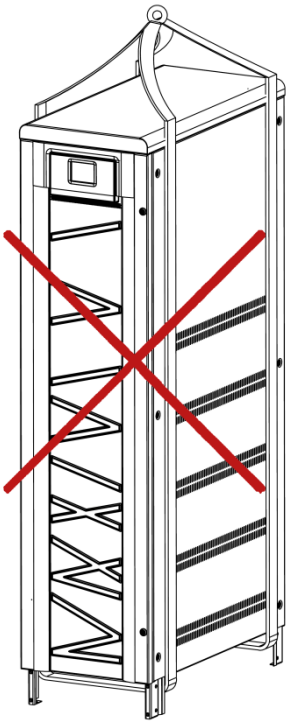
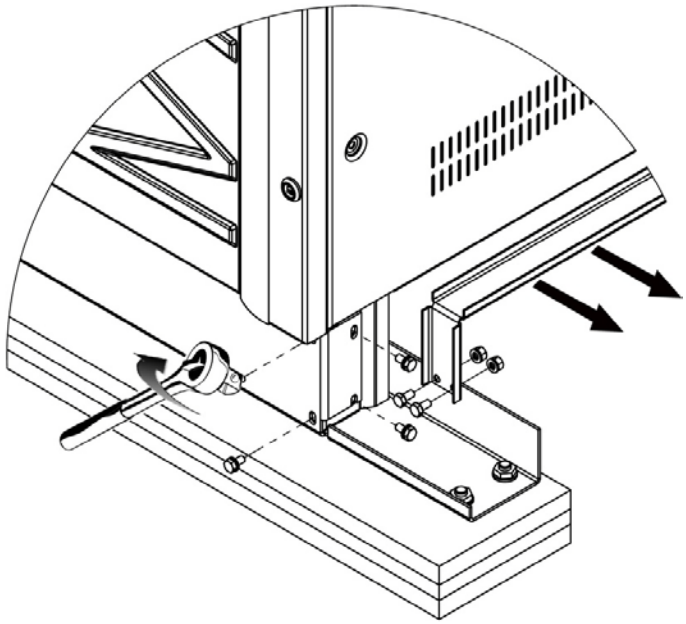


Figure.5.2-3



Place UPS in the installation area.

Figure.5.2-4



Remove the side parts which prevent the transpallet to damage the UPS.
Unload the UPS from the pallet.

It is recommended to store the original UPS packaging for future needs.

5.3. Installation Procedures and Instructions

The equipment may only be installed and commissioned by authorized LEGRAND UPS Technical Service Staff or authorized LEGRAND distributor Technical Service Staff.

When the UPS is brought from a cold place to a warmer place, humidity of the air may condensate in it. In this case, wait minimum for 2 (two) hours before powering the UPS.

KEOR T must be protected from voltage surge with devices that are suited to the installation; the mains voltage surge must be limited to 2kV. These protective devices must be sized to take into account all the installation parameters (geographical position whether or not there is a lightning rod, whether or not there are other suppressors in the electrical installation, etc)

Do not connect the output neutral to the protective ground or protective bounding (except the TNC Option). Keor T does not modify the neutral arrangements of the system; the use of an isolation transformer is required should it be necessary to modify the neutral arrangements downstream Keor T.

Power cables and communication cables shall be installed on trays according to the standards of the country.

5.3.1. Power Connections

Make sure that all circuit breakers are “OFF” before starting with the installation.

The power screw terminals are located on the lower front side of the UPS.
Firstly, open the UPS door, screw out of the metal cover, afterwards open plastic cover of terminals.
After the covers are removed, the cables shall be passed through the hole under the terminals.
After all connections done, replace the covers in order.

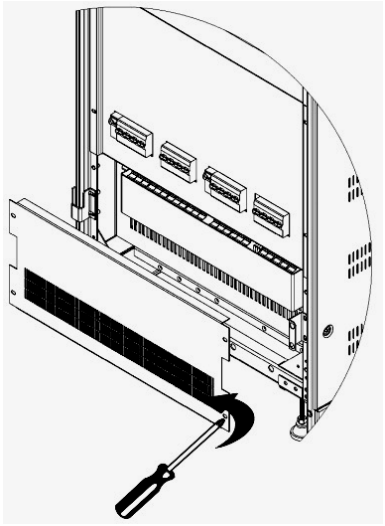


Figure.5.3.1-1

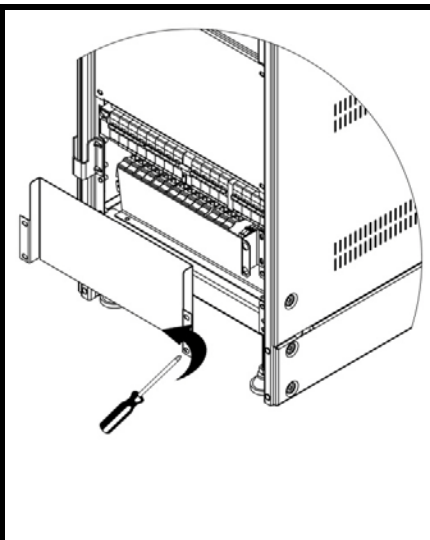


Figure.5.3.1-2

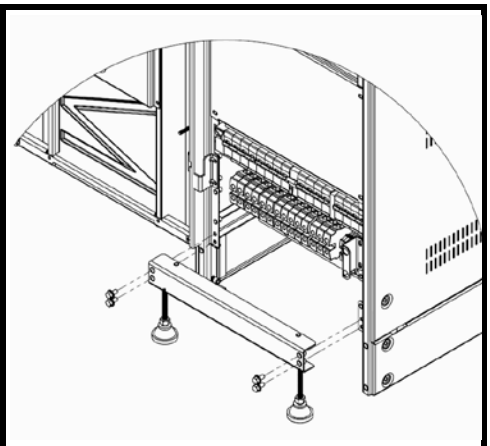


Figure.5.3.1-3

10-30kVA KEOR T

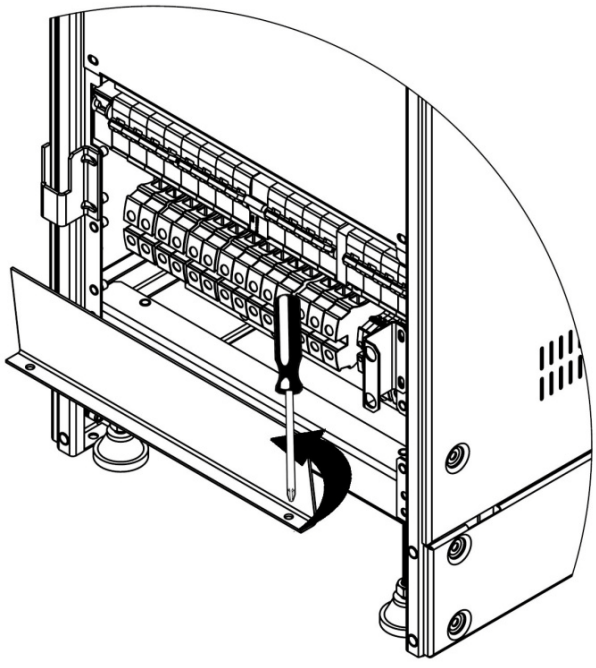


Figure.5.3.1-4

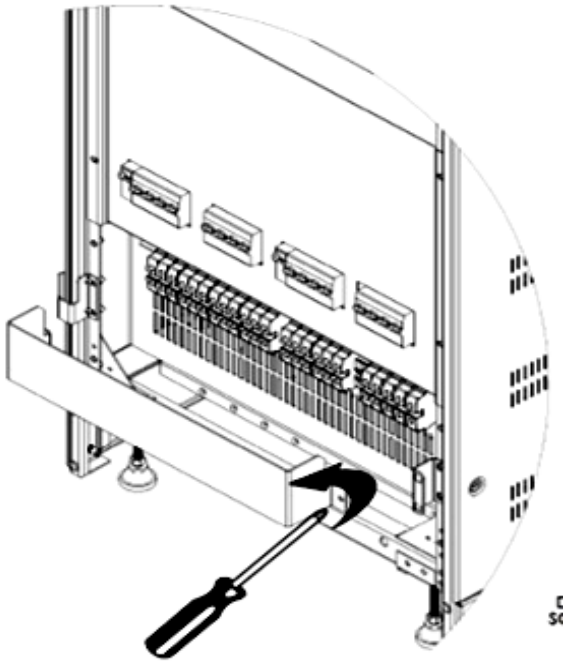


Figure.5.3.1-5

40-60kVA KEOR T

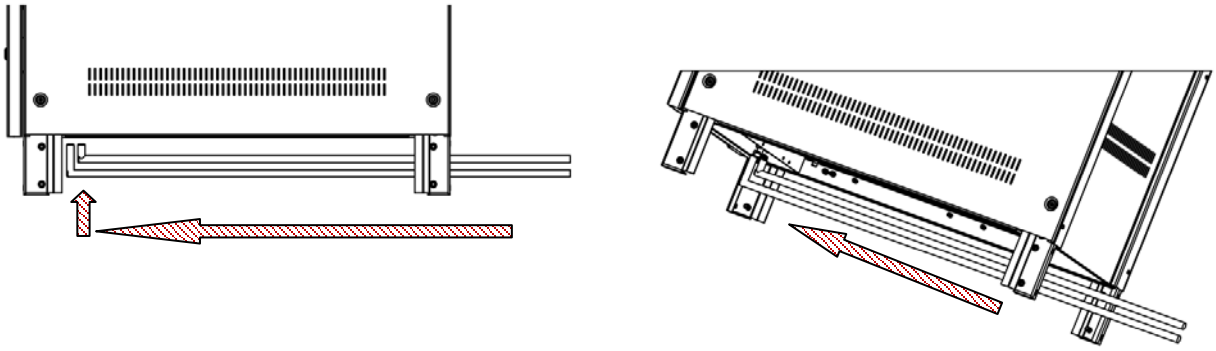


Figure.5.3.1-6

Power Cables Path

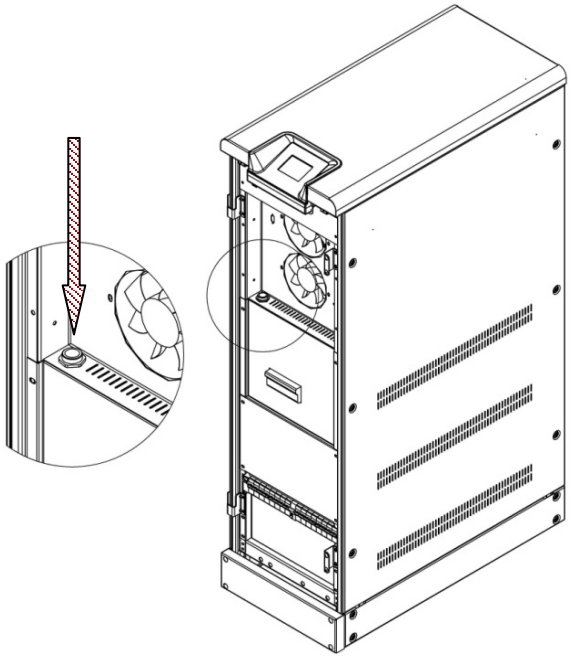


Figure.5.3.1-7

Communication Cables Path

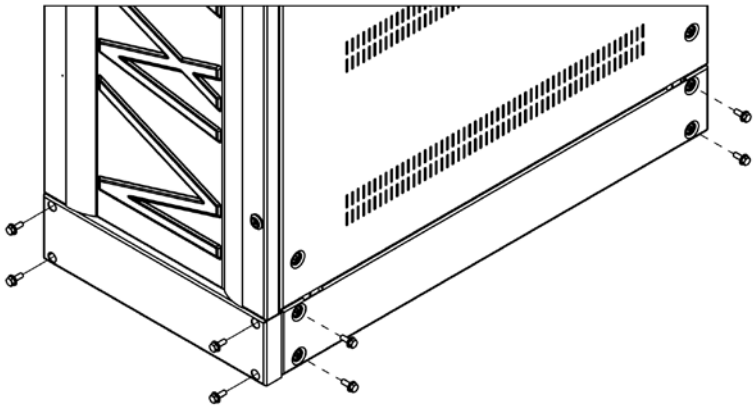
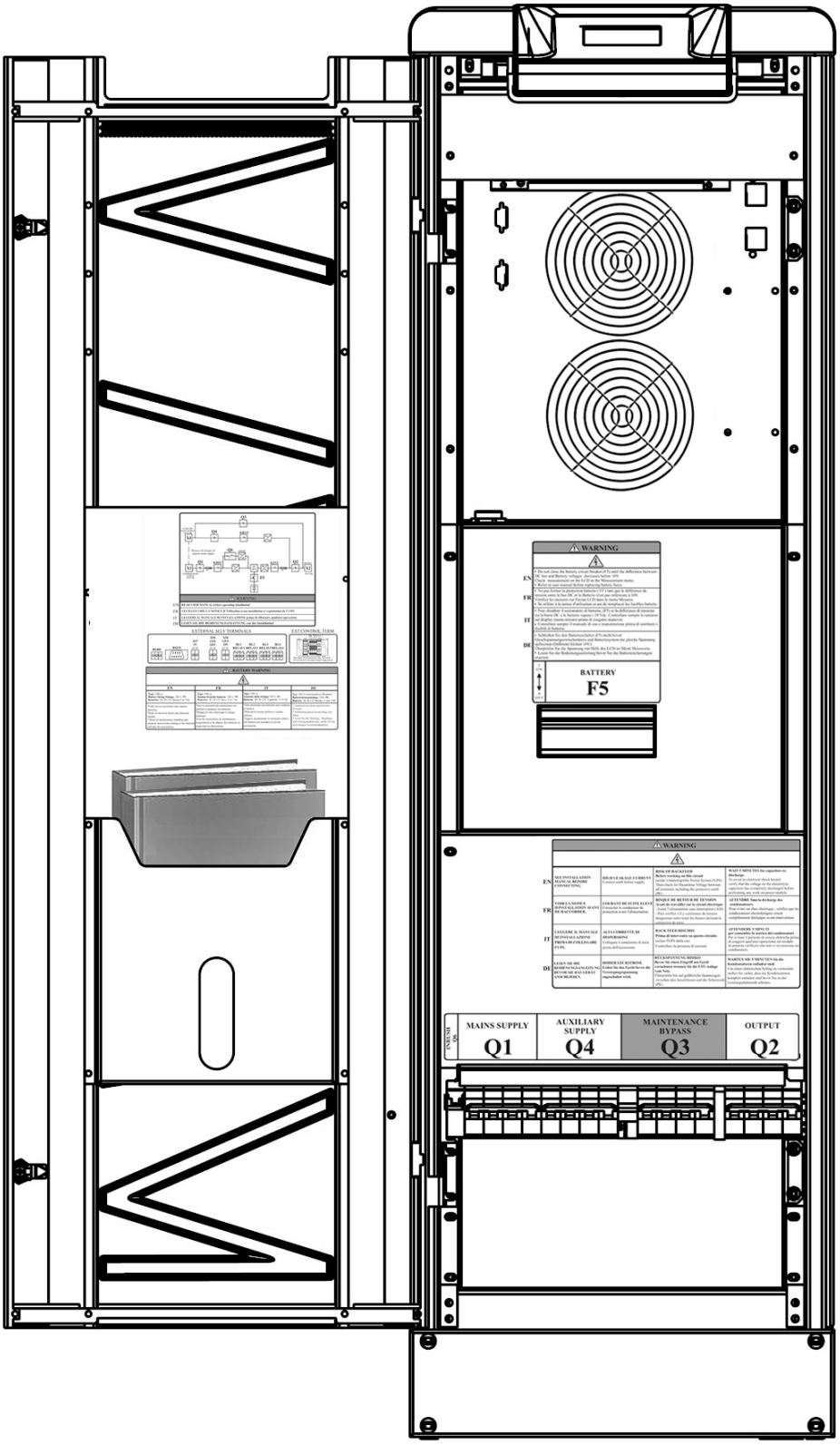


Figure.5.3.1-8

Fix the plinths delivered with the UPS after all cable installation done.

10-30kVA (3Ph Input – 3Ph Output) Circuit Breakers

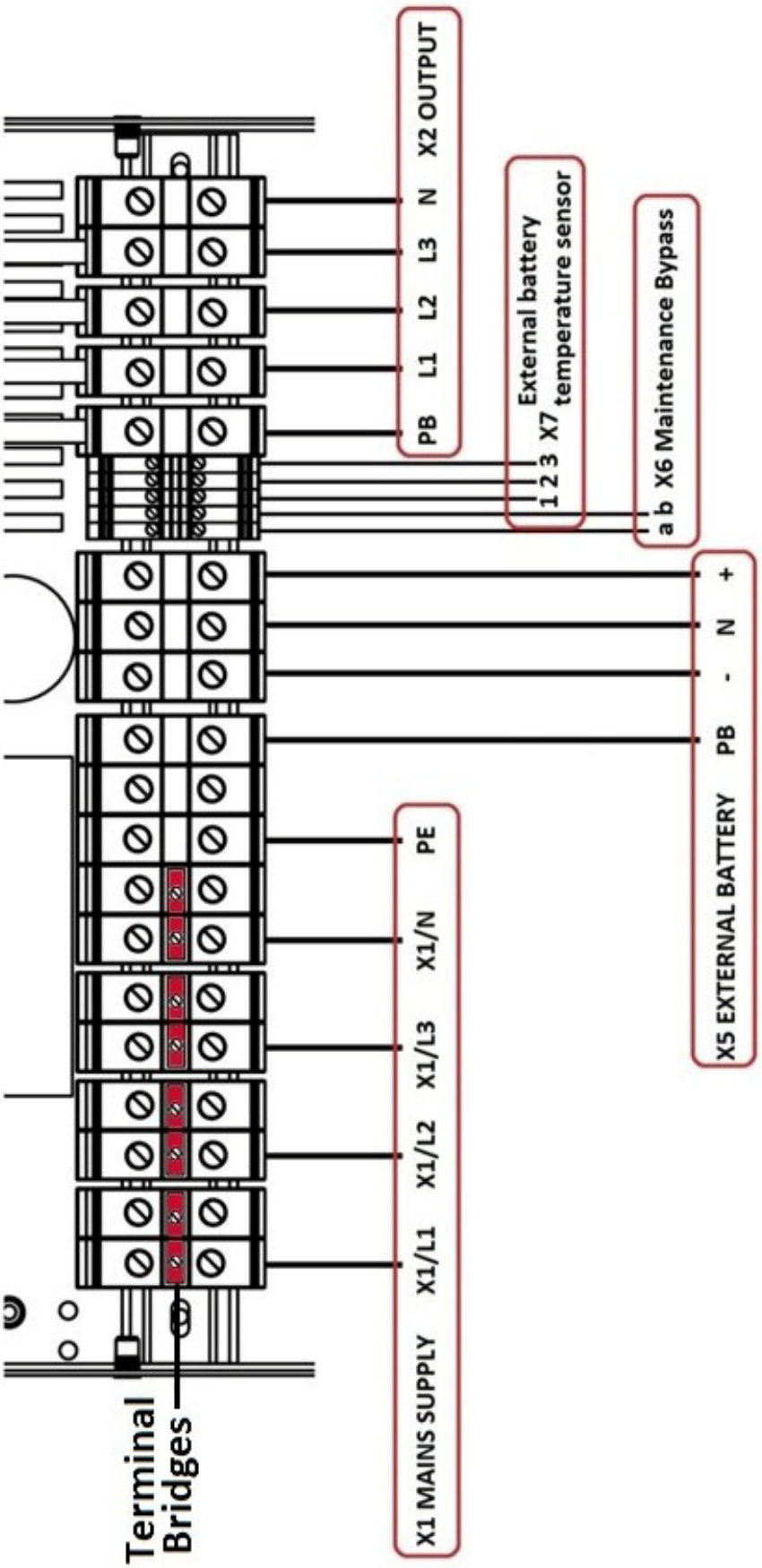
Figure.5.3.1-9



Q1: Common Mains Supply Circuit Breaker	**Q4:** Auxiliary Mains Supply Circuit Breaker
Q2: Output Circuit Breaker	**F5:** Battery Fast Fuse
Q3: Maintenance Bypass Circuit Breaker	**Q6:** Inrush Circuit Breaker

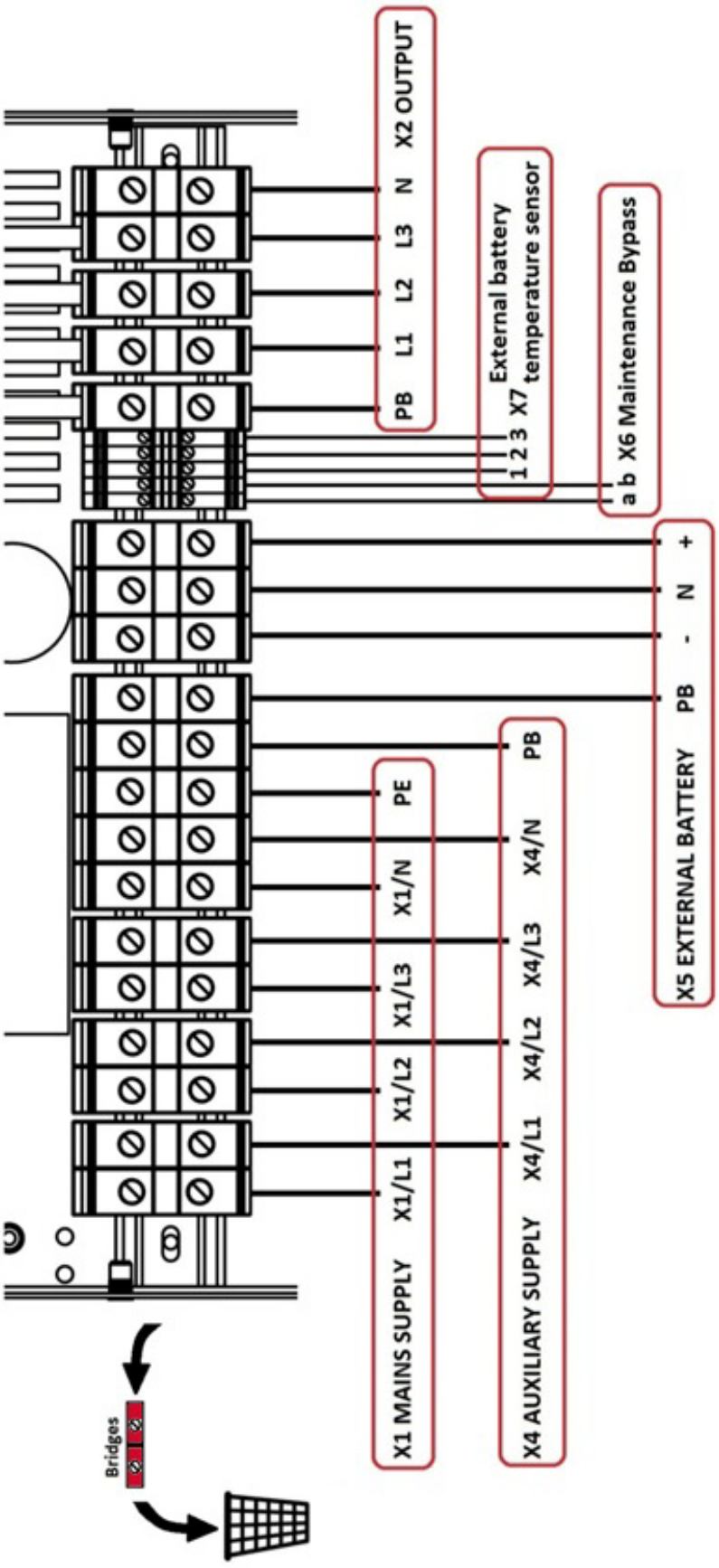
10-30kVA (3Ph Input – 3Ph Output)
Connection if the MAINS and AUX Supply are connected in COMMON

Figure.5.3.1-10



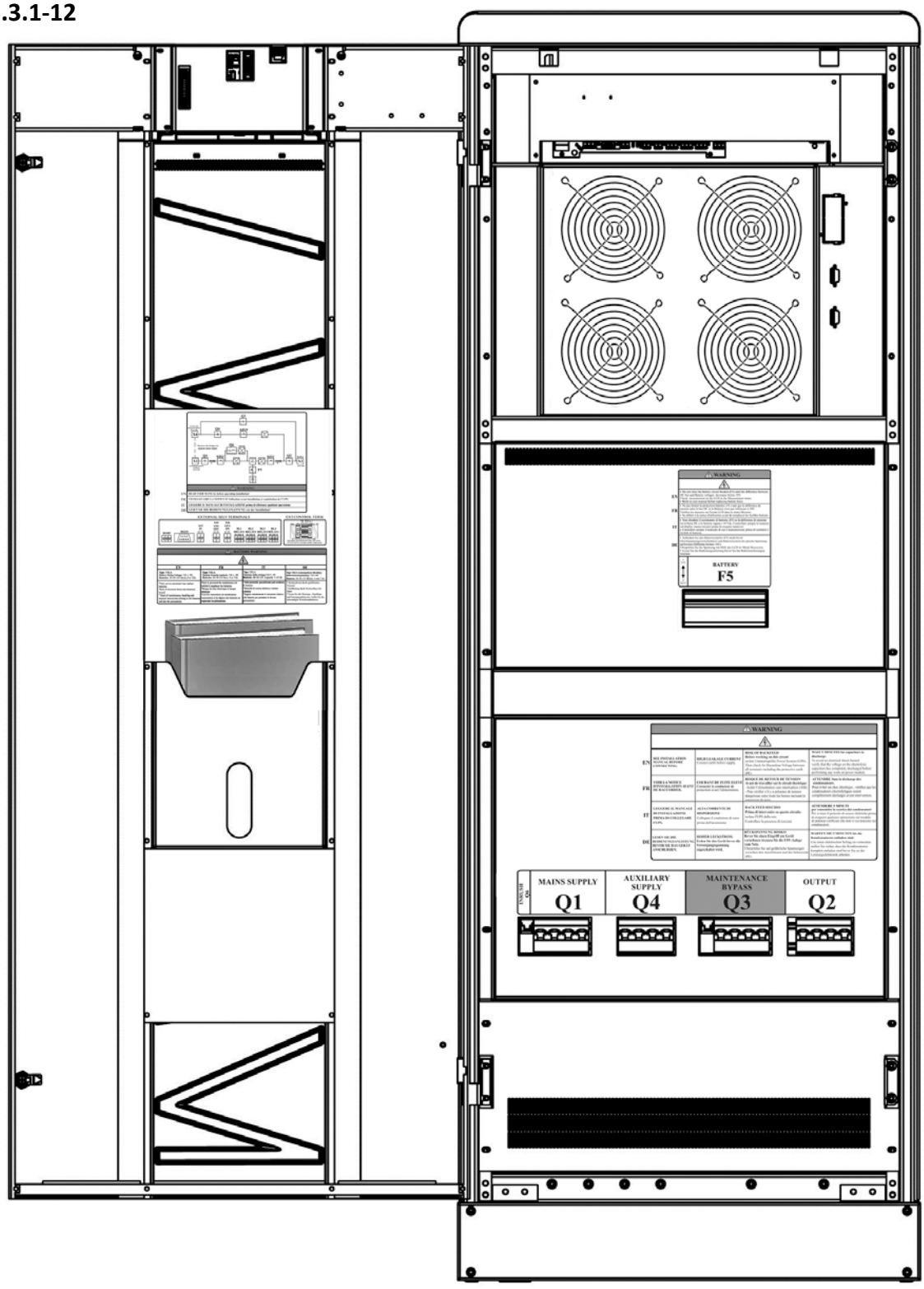
10-30kVA (3Ph Input – 3Ph Output)
Connection if the MAINS and AUX Supply are connected SEPARATELY

Figure.5.3.1-11



40-60kVA (3Ph Input – 3Ph Output) Circuit Breakers

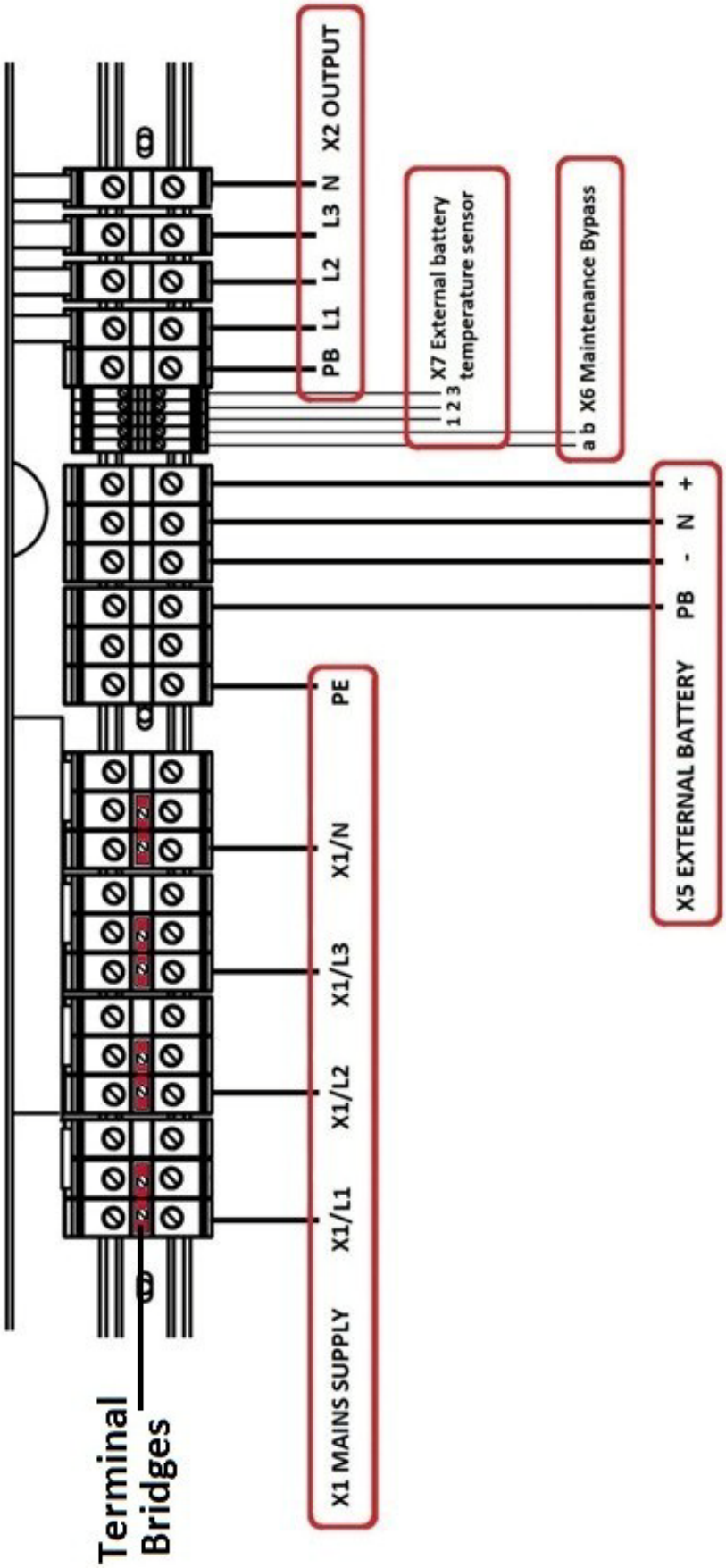
Figure.5.3.1-12



Q1: Common Mains Supply Circuit Breaker	**Q4:** Auxiliary Mains Supply Circuit Breaker
Q2: Output Circuit Breaker	**F5:** Battery Fast Fuse
Q3: Maintenance Bypass Circuit Breaker	**Q6:** Inrush Circuit Breaker

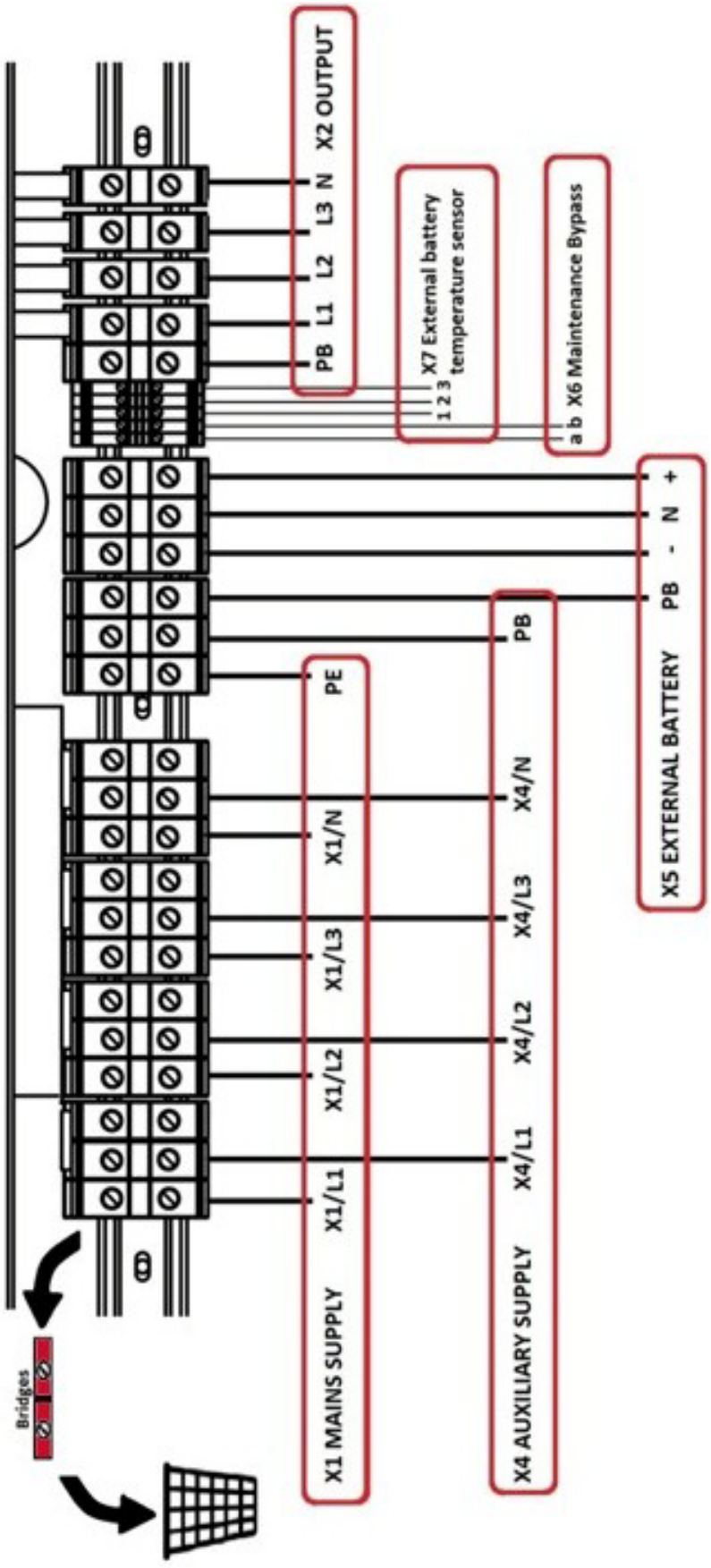
40-60kVA (3Ph Input – 3Ph Output)
Connection if the MAINS and AUX Supply are connected in COMMON

Figure.5.3.1-13



40-60kVA (3Ph Input – 3Ph Output)
Connection if the MAINS and AUX Supply are connected SEPARATELY

Figure.5.3.1-14

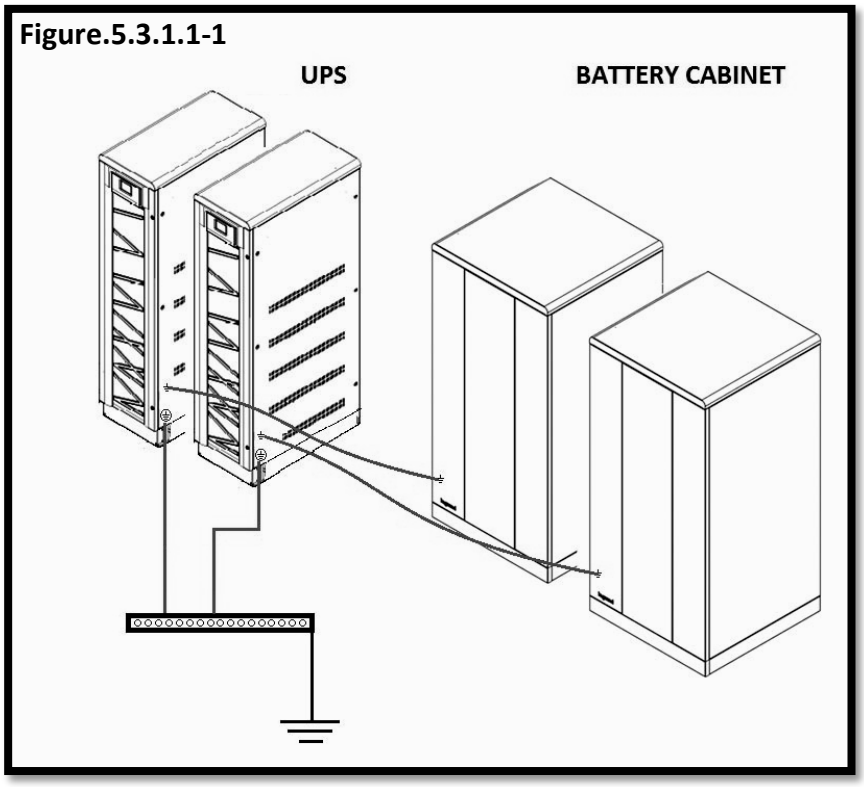


Connections shall be made in the following order;

5.3.1.1. Earth Connection

The device shall be earthed for a safe and reliable operation. Connect the PE/PB ground terminals before connecting any other cable.

Figure.5.3.1.1-1

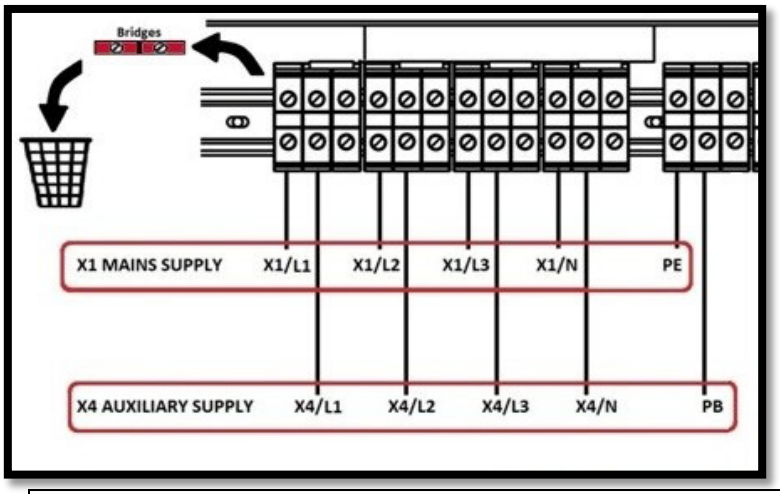


Input Mains Supply's Protective Earth terminal **PE** of the UPS shall be connected to the ground with a low impedance connection.
As the Auxiliary Supply Protective Bounding **PB** and Input Mains Supply's Protective Earth **PE** terminals are short-circuited inside UPS, it is not needed any connection.
Load ground should be connected to output **X2/PB** terminal of the UPS.
If there is an external battery cabinet present, it should be grounded via battery **X5/PB** terminal of the UPS.

5.3.1.2. Mains Supply (Rectifier) Connection

The installation and adjustment of distribution panel should be done by specialized technician.

Electrical Characteristics - Rectifier Input						
Model (kVA)	**10**	**15**	**20**	**30**	**40**	**60**
Rated mains supply voltage (V)	400 (3Ph + N)					
Voltage tolerance (V) (ensuring battery recharge)	208-467 (at half Load, without battery recharge) 338-467 (at full Load, with battery recharge)					
Rated frequency (Hz)	50/60					
Frequency tolerance (Hz)	from 45 to 65					
Power factor (input at full load and rated voltage)	≥ 0,99					
Table.4						



Please add three-pole (3-pole) MCCB to distribution panel for UPS's input. Do not connect any other load to it.

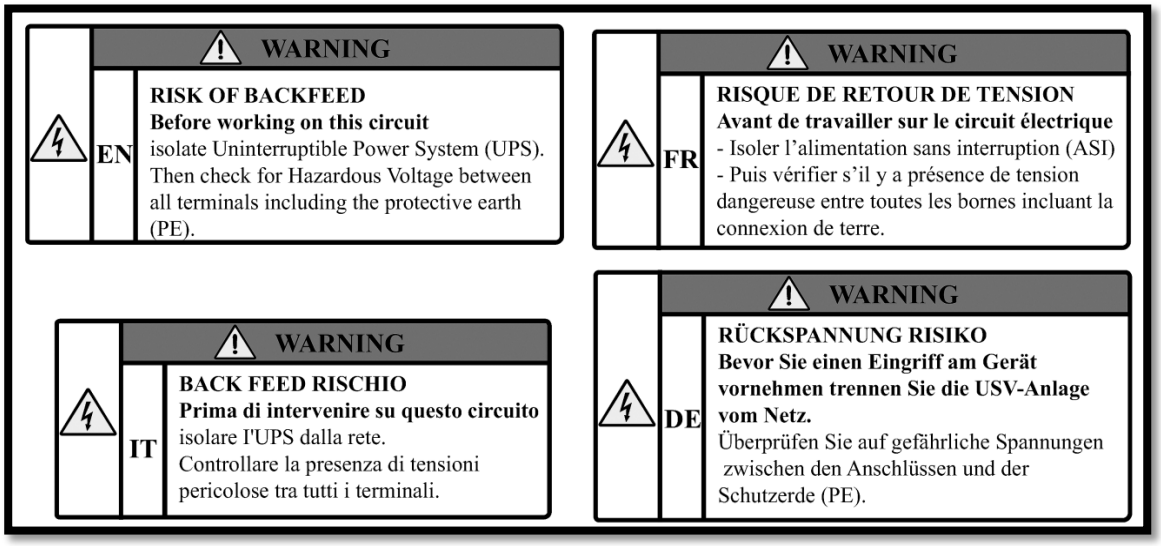
Connect the phase cables to **X1 MAINS SUPPLY: X1/L1 - X1/L2 - X1/L3** terminals, the neutral to **X1 MAINS SUPPLY: X1/N** terminal. Neutral connection should be done directly from distribution neutral bus to UPS neutral.

If auxiliary supply exists, <u>remove all bridges</u>. When used, the residual current earth leakage protection system must be common for the two AC inputs and installed upstream.

According to EN 62040-1, the user should place a warning label on the input distribution panel and the other primary power isolators, in order to prevent the risk of voltage backfeed.
This label is sent with the Installation Manual. It indicates:

RISK OF VOLTAGE BACKFEED

- Isolate Uninterruptable Power Supply before working on this circuit.
- Then check for Hazardous Voltage between all terminals including the protective earth (PE).


WARNING
EN
RISK OF BACKFEED
Before working on this circuit
isolate Uninterruptible Power System (UPS).
Then check for Hazardous Voltage between all terminals including the protective earth (PE).
WARNING
FR
RISQUE DE RETOUR DE TENSION
Avant de travailler sur le circuit électrique
- Isoler l'alimentation sans interruption (ASI)
- Puis vérifier s'il y a présence de tension dangereuse entre toutes les bornes incluant la connexion de terre.
WARNING
IT
BACK FEED RISCHIO
Prima di intervenire su questo circuito
isolare l'UPS dalla rete.
Controllare la presenza di tensioni pericolose tra tutti i terminali.
WARNING
DE
RÜCKSPANNUNG RISIKO
Bevor Sie einen Eingriff am Gerät vornehmen trennen Sie die USV-Anlage vom Netz.
Überprüfen Sie auf gefährliche Spannungen zwischen den Anschlüssen und der Schutzerde (PE).

5.3.1.3. Auxiliary Supply Connection

Electrical Characteristics - Bypass						
Model (kVA)	**10**	**15**	**20**	**30**	**40**	**60**
Bypass frequency slew rate	2 Hz/s settable from 1 to 3 Hz/s					
Bypass rated voltage	Nominal output voltage ±18% (settable)					
Bypass rated frequency	50/60 Hz (selectable)					
Bypass frequency tolerance	±3Hz					
Table.5						

Please add three-pole (3-pole) MCCB to distribution panel for UPS's auxiliary input.

If auxiliary supply exists, <u>remove all bridges</u>.

Connect the phase cables to **X4 AUXILIARY SUPPLY: X4/L1 - X4/L2 - X4/L3** terminals, the neutral to **X4 AUXILIARY SUPPLY: X4/N** terminal. Neutral connection should be done directly from distribution neutral bus to UPS neutral.

5.3.1.4. Battery Connection

You may find more information about Keor T Models and Battery capacity in Section 5.1. Models and Dimensions.

Danger of explosion and fire if the batteries of the wrong type are used.

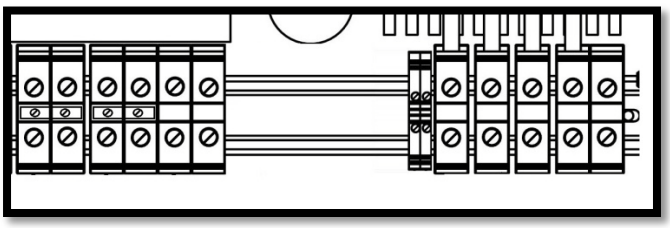
The batteries must be charged min. 10 hours before first-use.

Battery fast fuses shall only be replaced with fuses of the same type and rating.

Do not use internal and external battery together!

<u>Internal Battery Connection:</u>

If UPS with internal battery; there are no **X5** and **X7** terminals mounted on the UPS.



If the batteries are already built-in inside the UPS cabinet; in order to avoid any danger during transportation, some battery connections are left unconnected.

Thus, remove the left & right covers of UPS; disconnect the side panels' earth cables. Connect the unconnected battery cables to the related battery connectors. The unconnected cables are labelled. You may find detailed information about battery connection as follows.

There is no need any further connection, so reconnect the side panels' earth cables and replace the covers.

LETHAL VOLTAGE of nominal 720 VDC is present when the external battery connections are made.

KEOR-T 10-30kVA 1x60pcs 7-9Ah BATTERY WIRING DIAGRAM

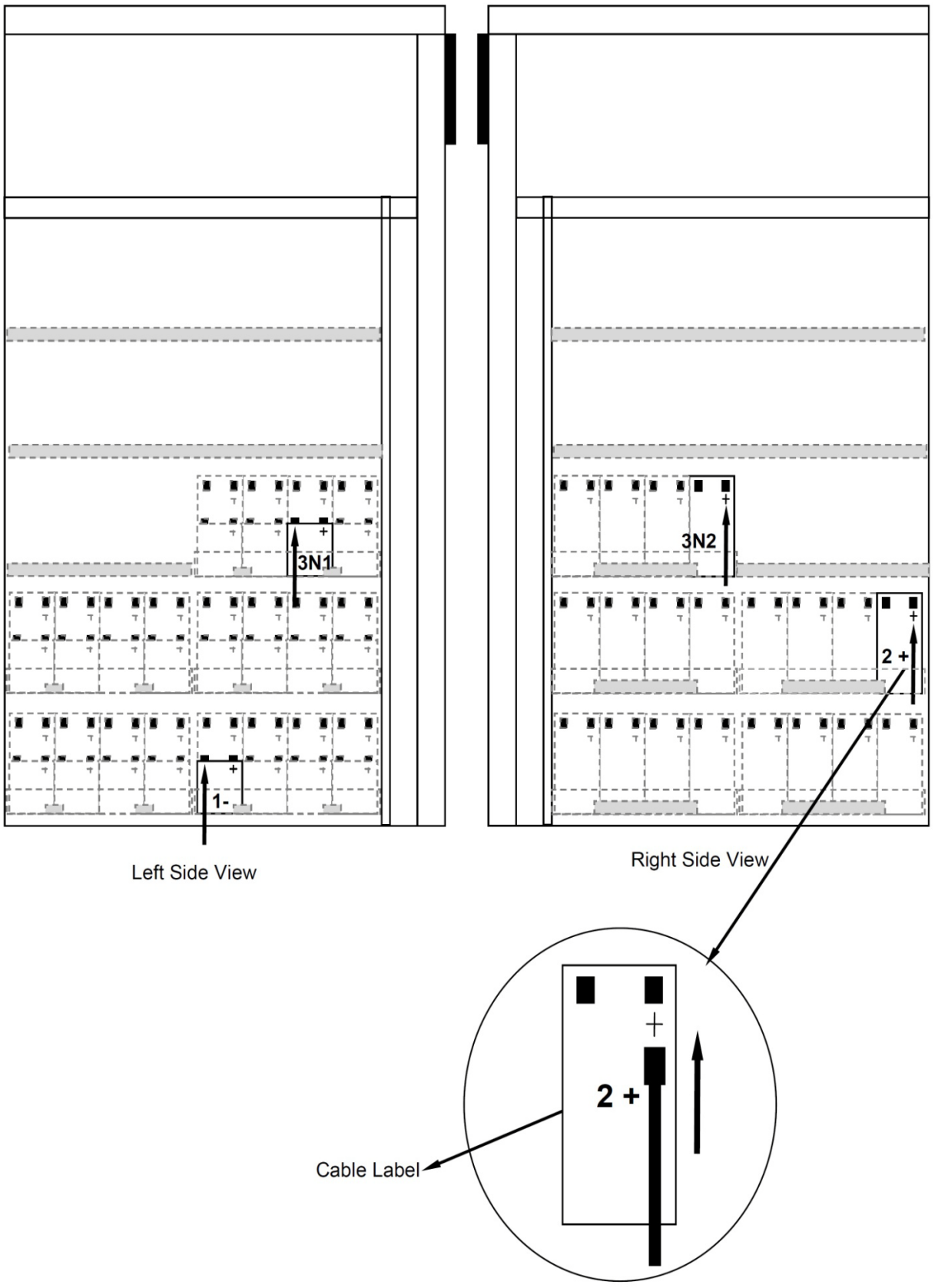


Figure.5.3.1.4-1

KEOR-T 10-30kVA 2x60pcs 7-9Ah BATTERY WIRING DIAGRAM

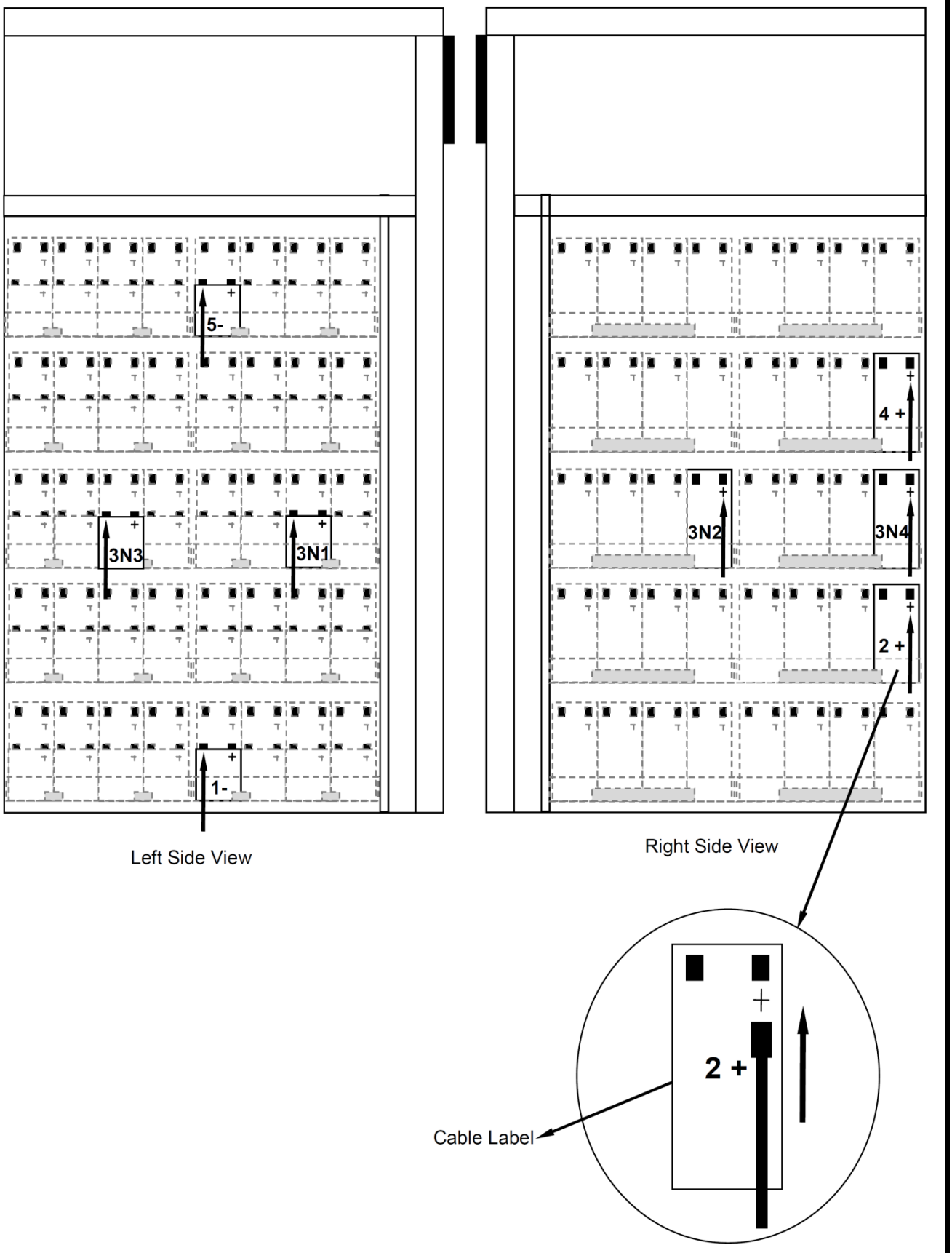


Figure.5.3.1.4-2

KEOR-T 40-60kVA 2x60pcs 7-9Ah BATTERY WIRING DIAGRAM

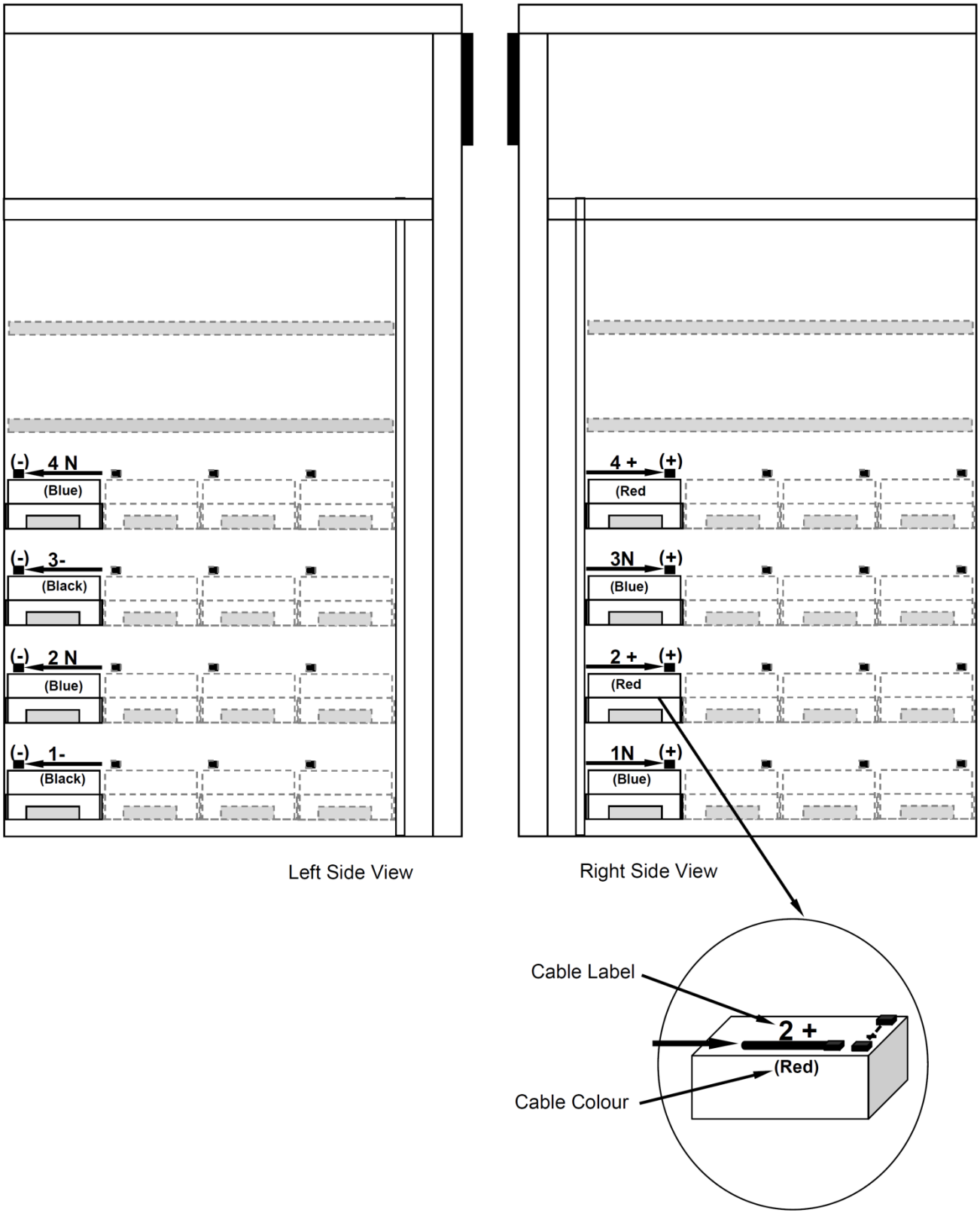


Figure.5.3.1.4-3

KEOR-T 40-60kVA 3x60pcs 7-9Ah BATTERY WIRING DIAGRAM

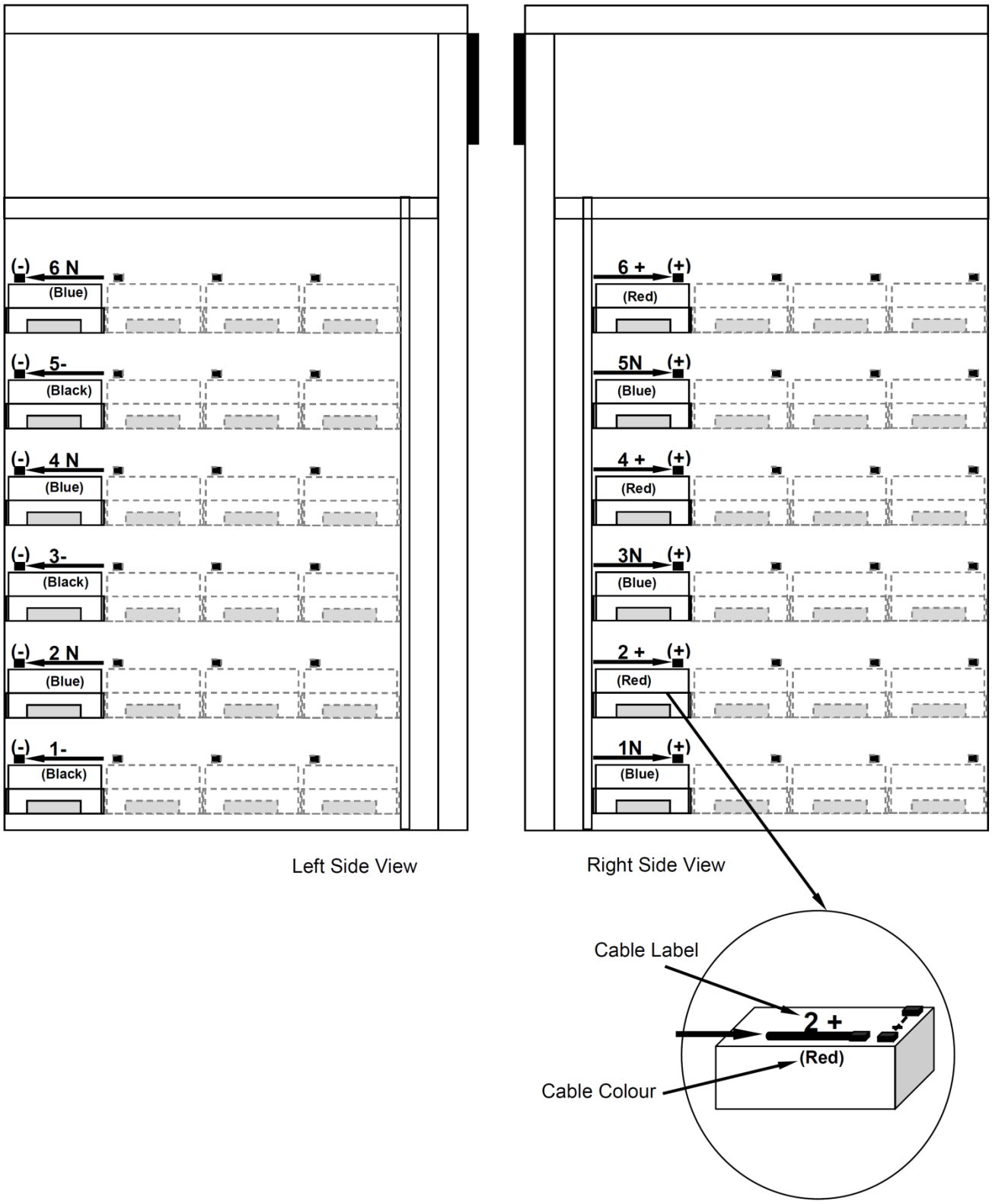


Figure.5.3.1.4-4

External Battery Connection:

If the batteries are in a separate additional battery cabinet, the cabinet should be supplied by the manufacturer.

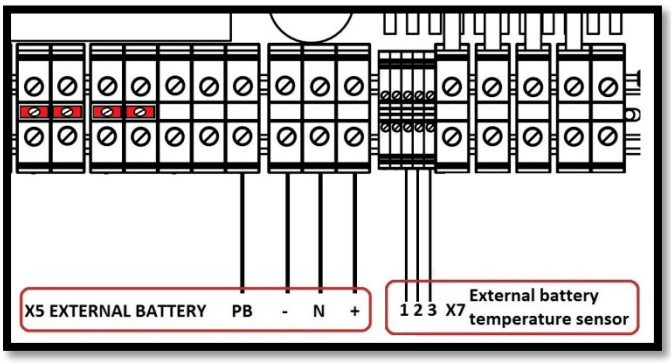
If battery cabinets not supplied by the manufacturer of Keor T, it is the installer's responsibility to check the electrical compatibility and the presence of appropriate protection devices between the cabinet and Keor T.

Read the **KEOR T Service Manual** carefully for **Battery Wiring Diagram in External Battery Cabinet!**

To avoid risk of electromagnetic interference separate the battery cables from Input and Output cables.

LETHAL VOLTAGE of nominal 720 VDC is present when the external battery connections are made.

For UPS and External Battery Cabinet Connections, please follow up the instructions below;



- Switch the battery cabinet circuit breaker to **"OFF"** position.
- **Ground:** Connect the **"PB"** on the battery cabinet to **X5 EXT. BATTERY: "PB"** on the UPS.
- **Negative String:** Connect the **"-"**on the battery cabinet to **X5 EXT. BATTERY: "-"** on the UPS.
- **Positive String:** Connect the **"+"**on the battery cabinet to **X5 EXT. BATTERY: "+"** on the UPS.
- **Neutral:** Connect the **"N"** on the battery cabinet to **X5 EXT. BATTERY: "N"** on the UPS.

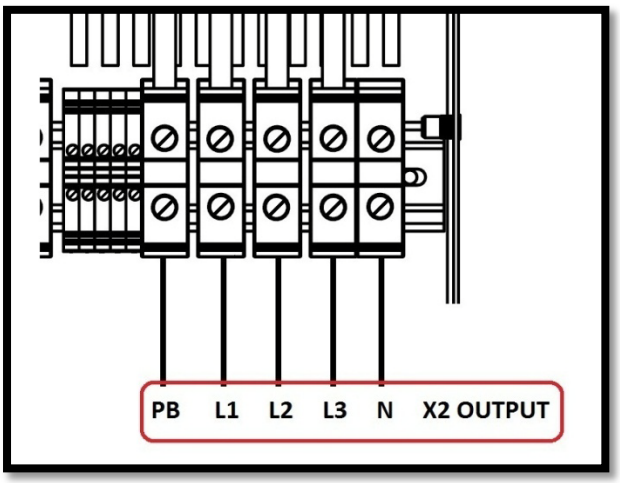
- **Temperature Sensor:** Connect the **X7: "X7/1 – X7/2 – X7/3"** on the battery cabinet to **X7: "X7/1 – X7/2 – X7/3"** on the UPS. (Double isolation cable 3x1mm^2 not extended 25m length is recommended)

Double check the polarity of battery connection!

5.3.1.5. Output Connection

Make sure that all circuit breakers are at "OFF" position before starting with the installation.

Electrical Characteristics - Inverter						
Model (kVA)	**10**	**15**	**20**	**30**	**40**	**60**
Rated output voltage (selectable) (V)	400 3Ph + N (380/415 configurable)					
Output voltage tolerance	static load ±1%, dynamic load VF-SS-111 compliant					
Rated output frequency (Hz)	50/60 Hz (selectable)					
Autonomous frequency tolerance	±0.02% on mains power failure					
Harmonic voltage distortion	< 2% with linear load, < 4% with non linear load					
Tablo.6						



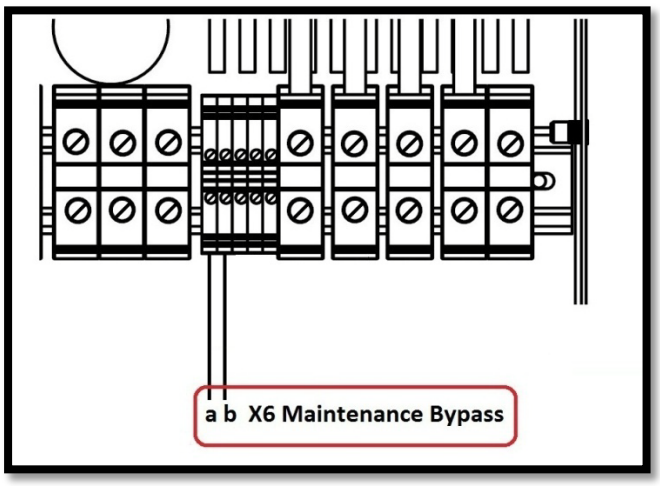
Please add three-pole circuit breaker to distribution panel where the loads are to be connected.
Connect the phase cable to **X2 OUTPUT: X2/L1 – X2/L2 – X2/L3** terminal and the neutral cable to **X2 OUTPUT: X2/N** terminal. Neutral connection should be done directly.

To enable the short circuit protection feature of the UPS, each load should be supplied through a separate circuit breaker chosen according to the load current. This may provide quick disconnection of the short circuited load and maintain operation continuity of the other loads.

Each load should be supplied through separate circuit breaker and the cable cross section should be chosen according to the load current value.

Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.

5.3.1.6. External Maintenance Bypass Connection



If external Maintenance Bypass would be used; connect normally open auxiliary contact of External Maintenance Bypass MCCB on the distribution panel to terminals **a/X6** and **b/X6**.

8. COMMUNICATION

Interface connectivity cards allow UPS to communicate in a variety of networking environments and with different type of devices.
Standard and optional communication interfaces are listed below;

Communication Interfaces						
Model (kVA)	**10**	**15**	**20**	**30**	**40**	**60**
RS232	•					
RS485 / MODBUS	•					
Dry Contacts	•					
Generator Interface	•					
Remote Emergency Switching Device (ESD) Interface	•					
Internal SNMP / Web Monitoring / e-mail	○					
External SNMP	○					
• **Standard** ○ Option						

Tablo.7

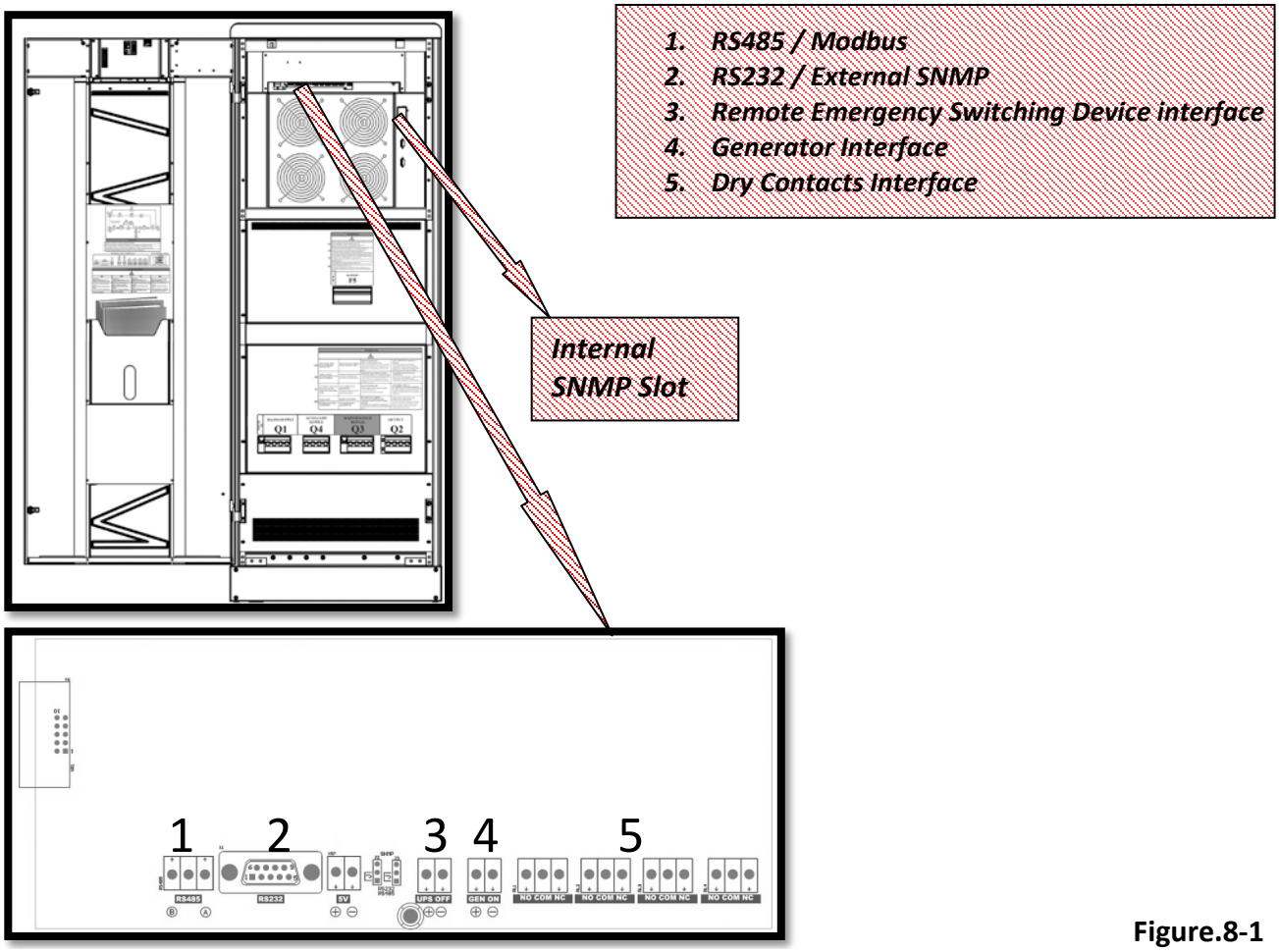


Figure.8-1

Inverter and Rectifier connectors are used for Technical Service only.
Do no not connect RS232 or external SNMP, damage may occur to your equipment and cancel your warranty.

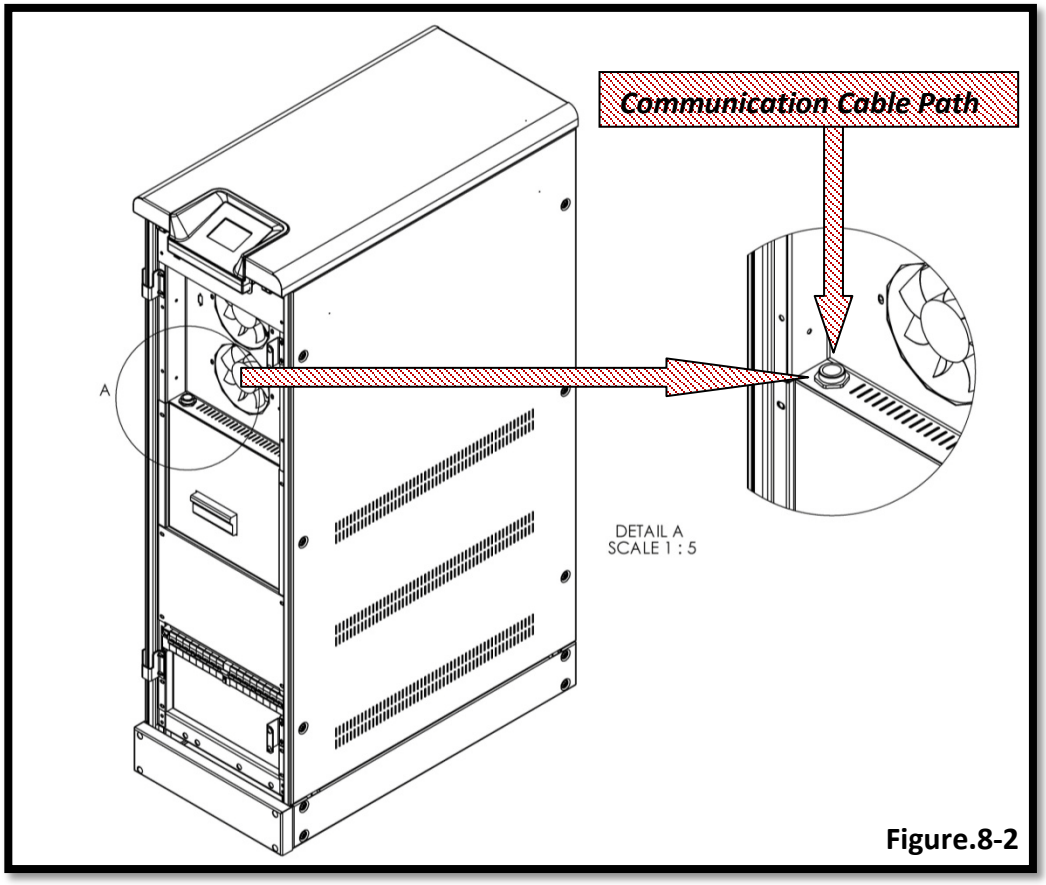
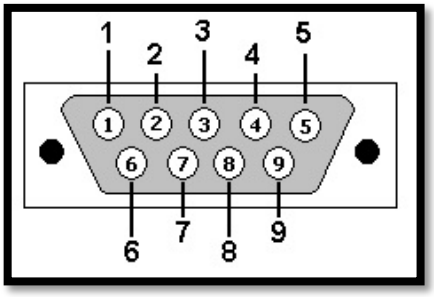


Figure.8-2

8.1. Serial Communication (RS232)

UPS is equipped with Serial Communication as standard. RS232 cable shall be shielded and shorter than 25m.

RS232: DSUB-9 male connector with the following pin layout shall be used on the UPS side of the connection cable.



RS232 PIN LAYOUT		
PIN#	**Signal Name**	**Signal Description**
2	RX	Receive Data
3	TX	Transmit Data
5	GND	Signal Ground
Tablo.8		

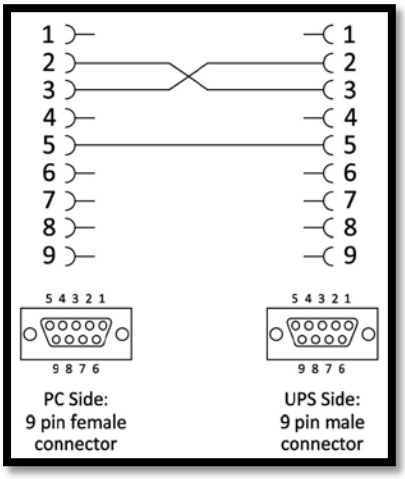
The communication solutions listed below can be used with this port:

- Monitoring Software (Optional)
- External SNMP Adapter (Optional)

Via SNMP; the information listed below can be monitored;

- The Latest Battery Test Date
- UPS Information (example: 220V - 50Hz)
- Input Data (V_{in}, F_{in}, V_{max} vb.)
- Output Data (V_{out}, Load Percantge...etc.)
- Battery Situation (V_{batt}...etc)

Over SNMP communication, battery test can be started or current test can be cancelled. UPS can be shut-down or stand-by (stand-by duration is adjustable). Alarms can be discarded.

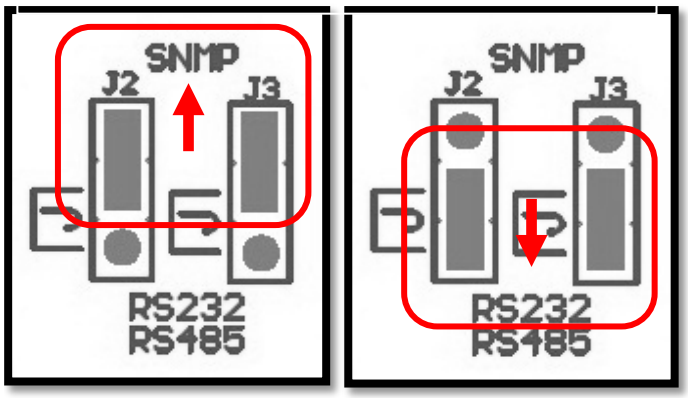


If Serial Communication cable is needed, it can be produced according to the pin configuration described at side.

8.2. Internal SNMP Communication

Internal SNMP card can be installed into SNMP slot placed at the front of UPS. As soon as SNMP installed, RS232 port would be disabled.
Internal SNMP has the same features as External SNMP; refer to Section 8.1 for more information.

SNMP **RS232 - RS485**



SNMP JUMPER (J2 – J3): If internal SNMP would be used, 2 jumpers should be moved to upper side.

If RS232 or RS485 would be used, 2 jumpers should be moved to lower side.

If the jumpers are at the upper side for internal SNMP configuration, RS232 and RS485 Serial Communication are disabled.
If the jumpers are at the lower side for RS232 or RS485 configuration, internal SNMP is disabled.

8.3. Emergency Switching Device and Generator Connections

Voltage to be applied to the digital inputs is 5VDC. Maximum current drawn by each input is 1mA. 5VDC supply provided on the communication interface board can be used to supply both digital inputs.

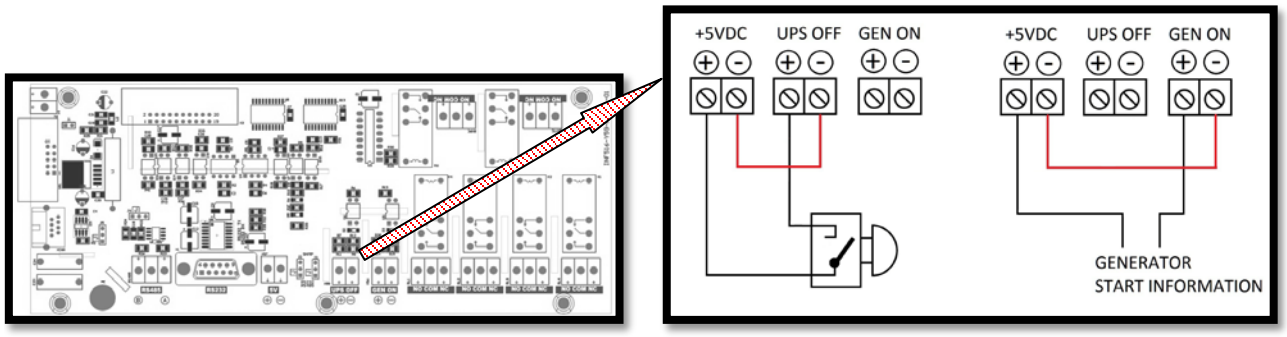


Figure.8.3-1

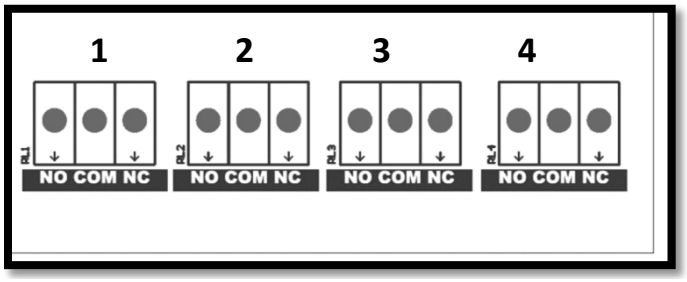
UPS output can be switched off immediately by Remote Emergency Switching Device interface (ESD) connection if desired. A remote latched switch can be used as described in above figure.

Input	Function
UPS OFF	If the UPS OFF input is set high by applying 5VDC voltage on the related terminals, UPS stops generating the output voltage and stops feeding the load. When the voltage on the digital input is removed, you have to restart UPS. **The factory default setting of ESD contact is "Normally open".**
GEN ON	If the GEN ON input is set high by applying 5VDC voltage on the related terminals, UPS transfers to Generator Mode, bypass and battery charging is disabled. Generator icon appears on Energy Flow Diagram screen. **The factory default setting of Generator contact is "Normally open".**

Tablo.9

Pay attention to the polarity of the voltages applied to the digital input terminals.

8.4. Dry Contacts



There are 4 dry contact sockets on the Interface Board. The relays can be programmable from **Relay Functions** menu (under **Settings** menu). "General alarm, Input failure, Battery failure, Output failure, Bypass active, Output overload, High temperature" alarms can be assigned to the contacts. Each alarm can be assigned to separate relays but also one alarm may be assigned to all relays.
Each output socket 3-pin and middle pin is fixed, the upper pin is normally closed and lower pin is normally open.
You may see the relay numbers as above.

Free contact relay connection cables shall have a cross-section of 1.5 mm^2.

Maximum voltage to be applied to the relay contacts is 42VAC rms (sinus) or 60VDC. Maximum contact current depends on the applied voltage and the load characteristic. Both maximum voltage and maximum contact current corresponding to the applied voltage shall not be exceeded.

Maximum allowed resistive contact currents for several voltages are given on the table below:

Applied voltage	Maximum contact current for resistive load
Up to 42 VAC	16 A
Up to 20 VDC	16 A
30 VDC	6 A
40 VDC	2 A
50 VDC	1 A
60 VDC	0.8 A
Tablo.10	

Each relay has both a normally open (NO) and a normally closed (NC) contact. One end of these contacts is common.

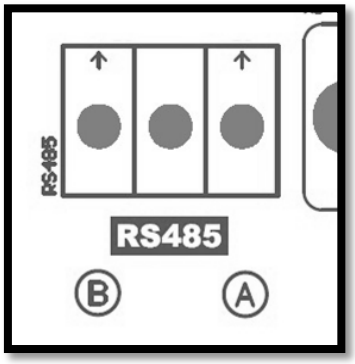
Relay functions are described below:

Relay	Default Function
Relay 1	General Alarm
Relay 2	Input failure
Relay 3	Battery failure
Relay 4	Output failure
Tablo.11	

Relay functions can be changed through front panel.

8.5. RS485

RS485 with MODBUS protocol is used in a wide range of automation systems for Industrial Process monitoring or for Building Management Systems. This communication link allows monitoring UPS status and measurements with such systems.



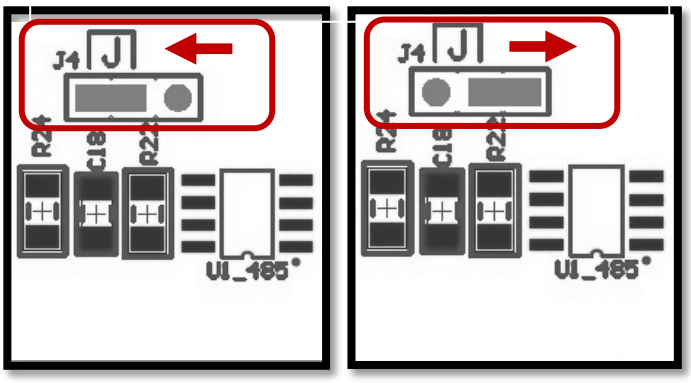
The RS485 differential line consists of three pins:

- A is inverting pin (TxD-/RxD-)
- B is non-inverting pin (TxD+/RxD+)
- Middle Pin is reference pin (optional GND)

Middle Pin is the reference potential used by the transceiver to measure the A and B voltages.
The B line is positive (compared to A) when the line is idle.

Communication Parameters	
Baud Rate	2400
Data Bits	8
Stop Bits	1
Parity	No Parity
Flow Control	No Flow Control
Communication Type	RTU
Tablo.12	

DEFAULT **MODBUS END**



MODBUS END JUMPER (J4): If the UPS is at the end of the bus; the jumper should be moved to right side to close the bus.

Appendix-1: Technical Specifications

Tower Model (3Ph/3Ph)	KEOR T 10KVA	KEOR T 15KVA	KEOR T 20KVA	KEOR T 30KVA	KEOR T 40KVA	KEOR T 60KVA
Output Power (VA)	**10.000**	**15.000**	**20.000**	**30.000**	**40.000**	**60.000**
Nominal Active Power (W)	**9.000**	**13.500**	**18.000**	**27.000**	**36.000**	**54.000**
RECTIFIER INPUT						
Nominal Voltage	400V (Ph-Ph) 3Ph+N					
Input Voltage Range (VAC) (at 50% Load)	from -52% to +17%					
Input Voltage Range (VAC) (at full Load, with battery charging)	from -15% to +17%					
Frequency (Hz)	45 - 65					
Power Factor	≥ 0.99					
BYPASS INPUT						
Nominal Voltage	400V (Ph-Ph) 3Ph+N					
Voltage Tolerance	±18% (Customizable)					
Frequency Tolerance (Hz)	±3					
Transfer Time (ms)	<1					
OUTPUT						
Nominal Voltage (VAC) (Ph-Ph)	400 (380/415 Adjustable)					
Power Factor	0.9					
Wave Form	Sinusoidal					
Frequency (Hz)	50 or 60 (Adjustable)					
Frequency Tolerance (Battery Operation)	0.01%					
Voltage Regulation (Static)	±1%					
Output voltage unbalance at reference unbalance load	<0.5%					
Maximum phase angle variation	0°					
Crest Factor	3:1					
Nominal Power (kVA)	10	15	20	30	40	60
Overload Protection (sec)	600 (at 100 - 125% Load) 60 (at 125 - 150% Load)					
THD_V	< 2% Non-Linear Load < 4%					
BATTERY						
Battery Type	Maintenance-Free Lead Acid Batteries					
Battery String (Blocks)	2x30					
PROTECTION						
Overload Protection, High Temperature, Input Over Voltage, Input & Output Over Current, Back-Feed Protection, Intelligent Charging Algorithm - Deep Charge Protection - Battery Test (Automatic / Manual), Short-Circuit Protection						

COMMUNICATION*						
Standard Interface	RS232, ESD, Genset, Modbus, 4 Programmable Relay Contacts					
Options	USB Converter, SNMP Generex or Megatec Protocol					
ENVIRONMENT						
Operating Temperature Range (°C)	0 - 40					
Battery Temperature Range (°C)	20 - 25 (Recommended For Longer Battery Life)					
Maximum Altitude without Derating (m)	1000					
Relative Humidity Range	20-95% (Non-Condensing)					
Acoustic Noise (dBA)	< 55 (at 1m)					
PYHSICAL						
Dimensions (HxWxD) (mm)	1345/1650 x 400 x 800				1650 x 600 x 900	
Weight (kgs) (Model 0)	118	132	134	140	255	277
Paint	RAL 7016@enclosure RAL 9005@front door metal					
STANDARDS						
Safety	IEC/EN 62040-1					
EMC	IEC/EN 62040-2					
Performance	IEC/EN 62040-3					
Design	IEC/EN 62040 ISO 9001:2008 - ISO 14001:2004					
Protection Class	IP 20 (other IP as option)					

* Please contact Legrand or your local authorized distributor for optional communication interfaces.

** The manufacturer reserves the rights to change the Technical Specifications and design without notice.

Appendix-2: Modbus List

While reading data through MODBUS, the following addresses can be used. "03 - Read Holding Registers" must be selected to read the MODBUS data.
We can send commands by using MODBUS. To do that function 06 – Write Single Register must be used.
The data is defined as unsigned words (2 bytes).

Address	Coefficient	Data Definition	Read (R) / Write (W)
100	1	L1 Input Voltage	R
101	1	L2 Input Voltage	R
102	1	L3 Input Voltage	R
103	1	L1 Input Current	R
104	1	L2 Input Current	R
105	1	L3 Input Current	R
106	0,1	Input Frequency	R
107	1	L1 Output Voltage	R
108	1	L2 Output Voltage	R
109	1	L3 Output Voltage	R
110	1	L1 Output Current	R
111	1	L2 Output Current	R
112	1	L3 Output Current	R
113	0,1	Output Frequency	R
114	1	L1 Output Load Percentage	R
115	1	L2 Output Load Percentage	R
116	1	L3 Output Load Percentage	R
117	1	L1 Bypass Voltage	R
118	1	L2 Bypass Voltage	R
119	1	L3 Bypass Voltage	R
120	1	Positive Battery String Voltage	R
121	1	Negative Battery String Voltage	R
122	1	Positive Battery String Current	R
123	1	Negative Battery String Current	R
124	1	Battery / Ambient Temperature	R
125	1	Positive DC Bus String Voltage	R
126	1	Negative DC Bus String Voltage	R
127	1	UPS Conditions and Alarms (***)	R
201	1	If "1" is sent then beeper will be on. If "0" is sent then beeper will be off.	R/W
202	1	If "1" is sent then a battery test will start.	R/W

Also we can use addresses 127 to get the UPS status. A decimal value will be received from address 127. If that value is converted to binary number, the UPS status can be read.

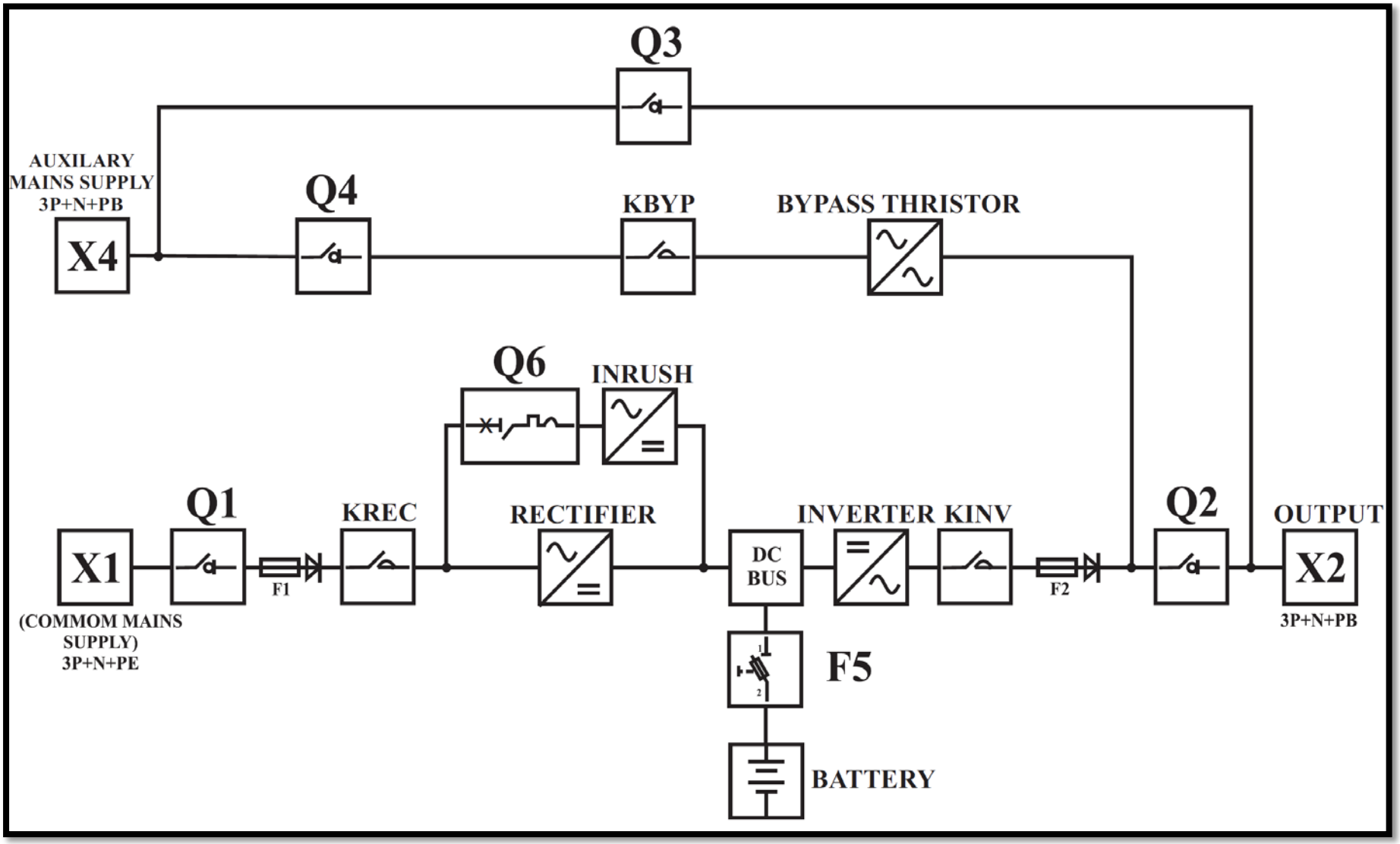
bit 0	UPS operates on Online Mode
bit 1	UPS operates on Bypass Mode
bit 2	UPS operates on Battery Mode
bit 3	Output voltage is out of limits
bit 4	Output overload
bit 5	Inverter temperature is high
bit 6	Rectifier temperature is high
bit 7	Ambient temperature is high
bit 8	Bypass is not synchronized
bit 9	Maintenance Bypass Breaker is “ON”
bit 10	UPS operates on Green Mode
bit 11	Battery Failure
bit 12	ESD interface is activated
bit 13	DC Bus voltage is out of limits
bit 14	General Alarm

Example: Let's receive 28673 (DEC) from address 127. If that value is converted to binary number, 111000000000001 will be obtained. Then the following status can be read from that number:

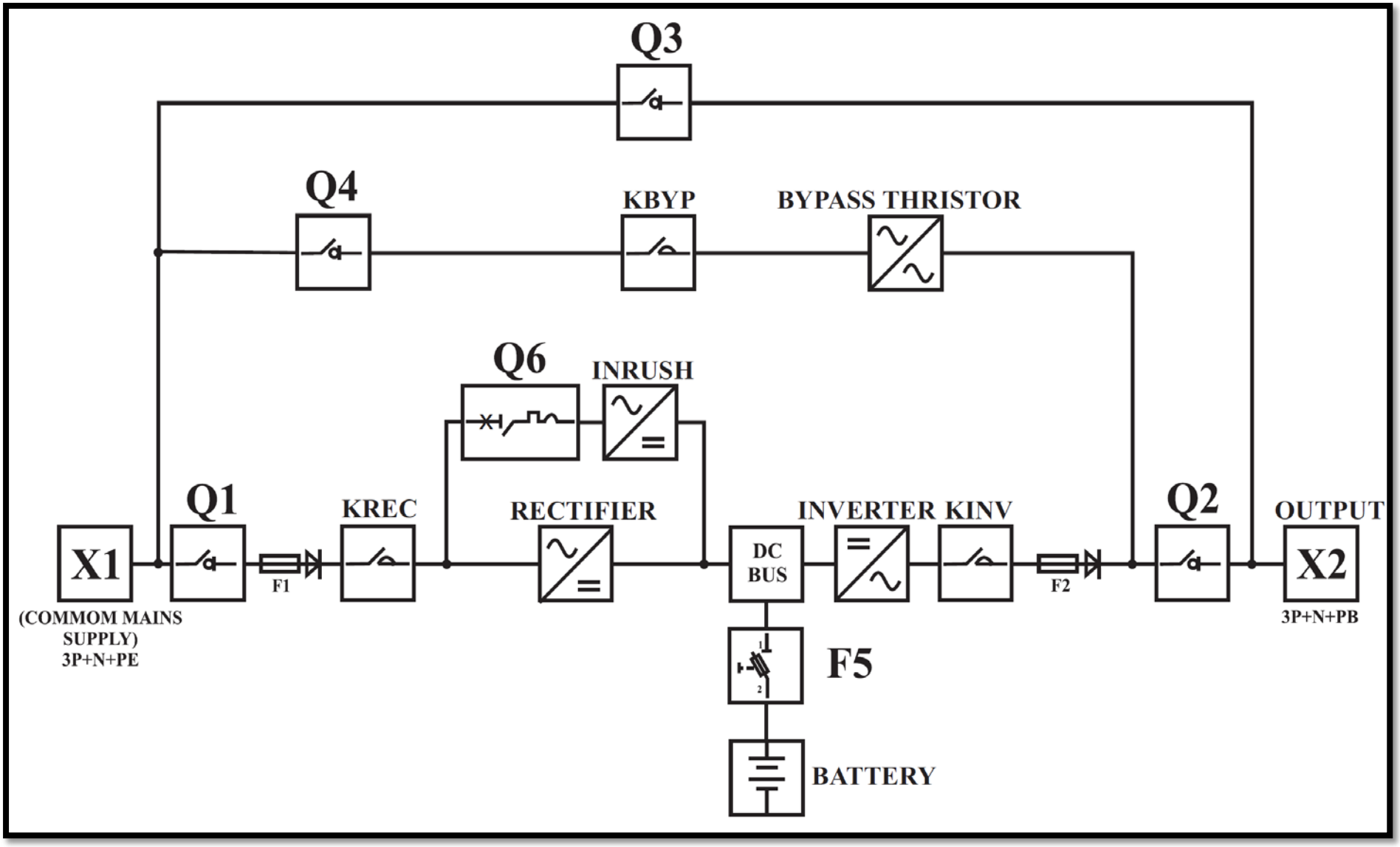
Online Mode
ESD interface is activated
DC Bus voltage is out of limits
General Alarm

Appendix-3: Description of UPS and Block Diagram

SEPARATED RECTIFIER AND BYPASS INPUTS



COMMON RECTIFIER AND BYPASS INPUTS



Name	Definition
Q1	Common Mains Supply Circuit Breaker
Q2	Output Circuit Breaker
Q3	Maintenance Bypass Circuit Breaker
Q4	Auxilary Mains Supply Circuit Breaker
F5	Battery Fast Fuse
Q6	Inrush Circuit Breaker
F1	Rectifier Fast Fuse
F2	Inverter Fast Fuse
KREC	Rectifier Contactor
KINV	Inverter Contactor
KBYP	Backfeed Contactor
X1	Common Mains Supply Terminals
X2	Output Terminals
X4	Auxiliary Mains Supply Terminals
BYPASS THYRISTOR	In case any inverter fault occurs; Bypass thyristors transfer the supply of the load electronically from inverter to Auxiliary Mains Supply without any interruption.
RECTIFIER	The rectifier generates a very constant DC voltage level by drawing current from the input with a power factor close to 1.
INVERTER	The inverter generates a very constant AC voltage level at the output by using DC voltage source at the rectifier's output.
BATTERY	Supplies the necessary energy when the mains voltage is not available.